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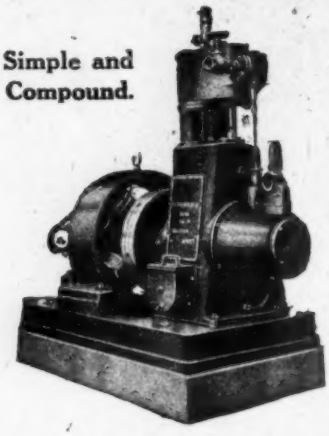

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THE PROBLEM OF RECONSTRUCTION.

QUITE an epidemic of eloquence on the subject of economic recovery has been raging of late. Lord Leverhulme, at the O. P. Club, remarked that 32 years ago he began a system of employment based on good wages, a bonus on production, and profit-sharing, but he found that the scheme only excited the opposition of Trade Unions. To manage a business successfully, he said, demanded vision and imagination, and prolonged training was a vital necessity; hence the idea that a board composed of untrained workmen could build up a business was futile.

Lord Haldane, addressing a meeting organised by the Institute of Industrial Administration, said the beginnings of a new social order were apparent, and there was a movement towards equality. The mass of the people was dissatisfied because it did not share in the advantages enjoyed by a smaller and more fortunate class. He would substitute for the power of Capital the principle of Service; all that Capital was entitled to was the interest necessary to attract it. Capital was not entitled to dominate; after the interest had been paid, residuary profits could be shared to pay wages and for special services. To the principle of Service he would couple that of Education, and on these they could lay the foundations of industrial peace—the State should undertake the education of democracy.

Lord Weir, before the Glasgow Chamber of Commerce, last week, laid down a number of conditions which he regarded as essential to a constructive policy. These included a temporary stabilisation of wages for 12 months, payment by results, freedom of employment, increase of working hours, and retrenchment on the part of the Government. He regarded the present situation as very grave, and capable of amelioration only by increased production, combined with greater efficiency. A vast industrial reserve was available but unutilised, owing to the dead hand of the Trade Unions, which denied it opportunity; let that restraint be removed, and he confidently predicted a wave of enterprise and development which would go far to improve the conditions. Lord Weir did not absolve the employers of blame in respect of their failure to formulate a definite policy for dealing with industrial problems.

Sir Robt. Hadfield, addressing the British Commercial Gas Association, emphasised the need for economy—not merely by cutting down expenditure, but by "the fruitful use of resources." He also advocated increased production, not for the enrichment of the few, but to save from privation the many, and to pay off the debts of the community; it was vital to the life of the people. Limitation of output, he said, was a crime against the community; there was work enough in sight to give employment to every man for years to come, but if the policy of low production for high wages was adopted, unemployment and destitution would inevitably be the outcome.

Lord Cowdray, delivering an address as Lord Rector of Aberdeen University, pointed out that while industrial capital could be destroyed, it could not be divided without simultaneous destruction; the Russian Bolshevists had discovered that they could not confiscate it—the overthrow of the system on which it was built up destroyed it. For that reason many Socialists proposed to retain the capitalist system, but to substitute the State for the individual employer; but the workers would not forgo the right to strike, even if the State were in control, as the present strike of the miners showed, and therefore the situation would not be changed unless, like the Communists, the State solved the difficulty by forced labour. In his view, the idea of partnership instead of conflict offered the only hope for the country. The prin-

ciples of the minimum wage and insurance against unemployment were included in this idea. The ideal wage comprised three factors: the guaranteed minimum, a variable amount proportional to individual output, and a variable addition according to the result of the undertaking—*i.e.*, piecework with a guaranteed minimum and a bonus on profits. He submitted to both employers and employed the importance of developing the third factor (the bonus on results), the workman sharing in the management. Partnership and mutual understanding would alone bring peace.

Here, then, is a remarkable symposium of leaders of opinion in industry and sociology. Each in his own way, and for the edification of a most heterogeneous series of audiences, has summed up the industrial position and offered a solution to the problems which it presents. There is a large measure of agreement between them; they all hold that the salvation of the country lies in increased production, and the adoption by the employer of a new attitude towards the employed. In future the latter must be regarded as a *partner*; he will not be fobbed off with piecemeal concessions, which merely aggravate the evil. As an American has put it, he will no longer work to enrich the "boss"; he means to share in the prosperity of the concern in which he invests his labour, and the princes of industry acknowledge the justice of his claim. But there is a vital condition to be fulfilled—that of unrestricted service, which is the indispensable precursor of prosperity.

The great problem before us, then, is twofold: to devise a genuine mode of partnership that will commend itself to the worker; and to convince the latter of the sincerity of the employer. Those factors solved, all the rest shall be added unto us.

The Lighting, Heating and Power (Emergency) Order, 1920.

This Order, like a good many other Orders, has induced a state of perplexity in the minds of the recipients. Electricity supply undertakings are much exercised as to exactly what they are really expected to do under the Order. As a matter of fact, it is really difficult to see what they *can* do. The Order *imprimis* is directed to consumers. It is quite clear what *they* have to do—cut off all advertising or display lights, and to economise generally, and if they own a "factory," reduce their power consumption by half. Again, it is clear who are the people who have to see that this is done—the Local Authorities. The undertakers are not mentioned by name. The only reference which can be construed as implying a duty on them is Clause 3, which states: "where gas or electricity is required for power in any premises within the scope of Part III of the Coal (Emergency) Order, 1920, its supply and use shall be restricted so that not more than 50 per cent. of the weekly average quantity *supplied* or used for power in the four weeks last preceding the date of the Order coming into force *shall be supplied* or used. . . ."

But it is to be noted that all the foregoing about "supply" is in the passive. Read in conjunction with Clause 7, this might be taken as a method of specifically legalising the undertaker's action in obeying the orders issued by the local authority with regard to cutting off supply to consumers as provided in the clause mentioned. There certainly does not appear to be any obligation resting on the undertakers to deal with the 50 per cent. decrease, except by cutting off consumers under the direction of the local authority. As a matter of fact, the words "supplied or used" mean, as applied to electricity, the same thing. The meter readings and data as to consumption are certainly, under Clause 6, to be ascertained by the owner, occupier, or manager of the premises.

Clause 4, dealing with the power of the local authority to increase the percentage, primarily applies obviously to the applications of individual consumers; but it also reads as applying to a conceding of the raising of the percentage all round, on the general application, say, of the undertaking. The Order will obviously be excessively difficult to enforce. The industry is in no way responsible for the directions; the Board of Trade did not consult it before drafting. Still, it is up to every undertaking to do the best it can from a patriotic standpoint. Also, it is to the interest of all undertakings to conserve their stocks of coal. What the undertakings have to do, therefore, is to uphold the necessity for economies in every way possible, and to take every step to bring the provisions of the Order before the notice of consumers. They should also, of course, let all consumers understand that if the Order works hardship in a factory, there is an appeal to the local authority, as the latter must have due regard to the maintenance of food supplies (including beer), hospitals, entertainments, and so forth. They can send out notices to consumers, with receipts, correspondence, &c. They can advertise in the local Press. They can display notices at their stations, sub-stations, offices, showrooms, and so forth. They could send round notices to all consumers, asking, perhaps, the local authority to pay for the stamps, &c. Anyhow, the loyal co-operation of undertakers is an obvious duty. A great deal can be done by the chiefs seeing that everyone on their staffs is thoroughly impressed with the gravity of the situation, and replies to all inquiries of consumers accordingly. If the assistants speak lightly in connection with any inquiry as to compliance with the Order, and the duty of doing so, the consumer will naturally act accordingly. Loyalty in thought *and word* is what is wanted.

Joint Industrial Councils.

We were very pleased to publish last week in our "Correspondence" columns a letter from Mr. Webb, of the Electrical Trades Union, on the question of the Whitley Councils in the electricity supply industry. We should certainly welcome further comments, either from the Trade Unions' side or from the employers' side, since we think that nothing but good can result from open and candid discussion. For one thing, it stimulates interest in this most important matter—an interest which, we are afraid, is at present of a somewhat indifferent quality. For another thing, provided the letters are similar to Mr. Webb's—that is, of a constructive character and dealing with principles—they contribute something definite towards a final formulation of policy. The electricity supply industry has always suffered somewhat from lack of constructive policy. There has always been an inclination towards criticism rather than construction. So, in this matter of industrial policy, it would be much more to the point if correspondents would come forward and tell us, not how bad things are, or are likely to become, but exactly what they think ought to be done. The Industrial Councils in the supply industry are new ventures. Ultimate success depends on their being directed on lines of sound policy. An open discussion, therefore, would at this stage be not only pertinent, but particularly useful.

It should certainly be the ambition of the industry that these Industrial Councils should be exemplars to those in all other industries. So far, the Councils for the electricity supply industry seem to be ahead of all others in completeness and comprehensiveness. They started, of course, with much in their favour. The electricity supply industry is, perhaps, more fully organised industrially than any other industry of its size. Broadly speaking, we might say that every employé belongs to a Trade Union; on that side, therefore, the organisation is complete. The employers' side is similarly almost fully organised; the four Associations representing respectively the London companies, the power companies, the provincial companies, and the municipal authorities cover practically all the undertakings in the country. Further, since the competitive element is non-existent in the supply industry, there is no danger of disintegration on this score. The industry, therefore, presents the ideal conditions for Whiteleyism, and, given the necessary statesmanlike ability in the leaders on both sides, there is no reason why the Councils in this industry should not stand foremost among all industries in full and efficient development. Exactly what form the final development will take it is impossible as yet to say. The whole thing is a matter of *growth* and gradual adaptation to the evolving necessities of the case. This it is which makes the matter one of such great interest and importance. And the lines of growth will be determined by the ideals in the minds of those who deal with it.

ROTHERHAM ELECTRICITY WORKS.

We were recently enabled, by the courtesy of the engineer and general manager of the Electricity Supply Department of the Rotherham Corporation, Mr. Edward Cross, to visit the new power station which is now approaching completion, and to obtain the photographs which are reproduced in the following pages. This installation is of exceptional interest, as being the first "super-station" to be put into operation, and as containing the largest turbo-alternator yet installed in this country. It is laid out for two 12,500-kw. generating sets and four of 30,000 kw. each, making a total of 145,000 kw.; of these machines the first two are in commission, and the first 30,000-kw. set is in course of erection. The boiler house consists of four sections, of which one is complete and the second approaching completion. It will be seen, therefore, that the new station constitutes a very important addition to the electrical resources of Yorkshire, where it is included in the "North-East Midlands Electricity District."

But it is not only in point of sheer magnitude that the plant is noteworthy; its most striking feature is the extraordinary rapidity with which it has grown from a minor to a major undertaking. When war broke out, the Rotherham Electricity Works comprised plant of only 4,500 kw.; during the war its capacity was increased by the addition of two 5,500-kw. generating sets to 15,500 kw., making, with the 55,000 kw. of the new station, an aggregate of 70,500 kw.—an increase of 1,467 per cent. in six years.

The question at once arises why so large an amount of power was called for; the answer is that during the war the demand increased at a phenomenal rate, so that the possibilities of the existing station were speedily overtaken, and early in 1917 it was decided to embark on the very ambitious scheme of which the first instalment is nearly complete. It will be remembered that at that date the Government scheme for the concentration of generating plant in large stations was still in the distant future, for the Coal Conservation Committee had not then issued its final report. The population of Rotherham at the last census was under 63,000; the cost of the electrical undertaking, including the existing plant and the projected new station, was over £1,000,000. It will be seen, therefore, that in embarking upon this huge scheme—which, moreover, only embraces one-half of the ultimate capacity contemplated for the undertaking—the Corporation of Rotherham displayed a degree of enterprise and an amount of confidence in its electrical engineer for which it would be impossible to find a parallel in this country, or perhaps anywhere, in the whole history of municipal electricity supply.

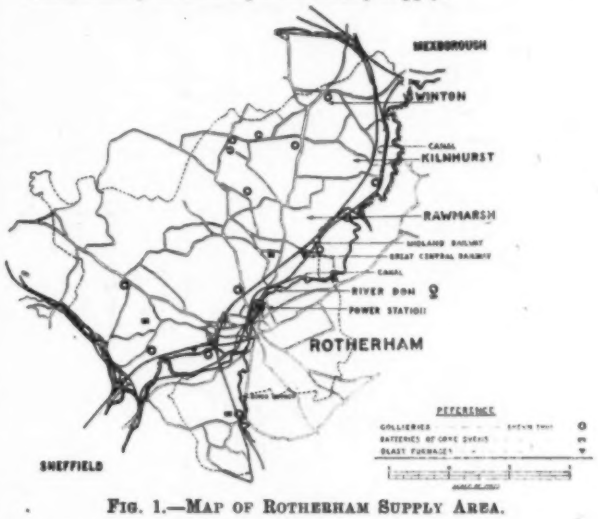
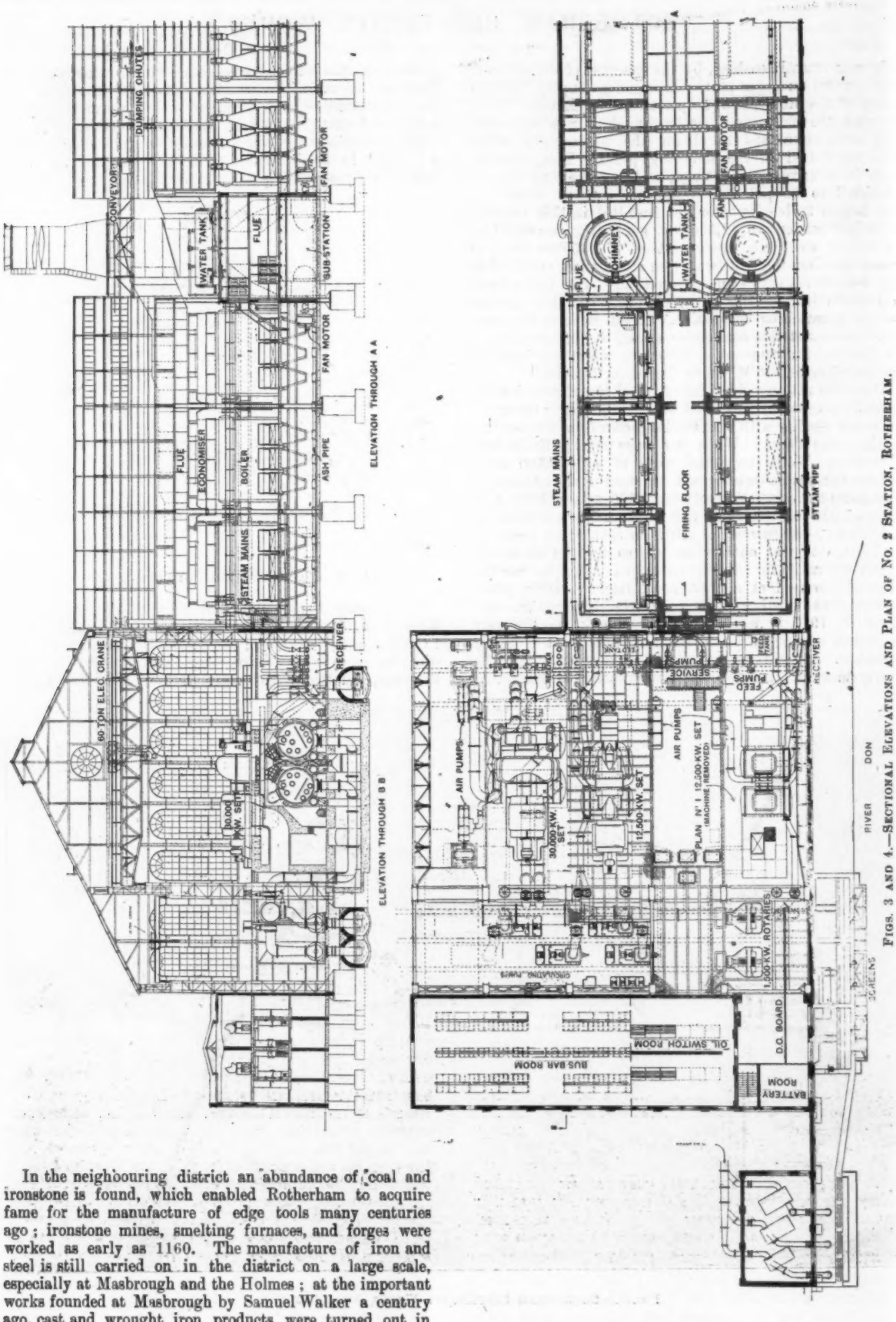


Fig. 1.—Map of Rotherham Supply Area.

The County Borough of Rotherham is situated on the River Don, 6 miles to the north-east of Sheffield, and 12 miles from Doncaster; it is in direct communication with the main lines of the Great Northern and Midland Railways, and the Great Central Railway runs through it. The town has long been noted for its iron and steel works, and for the glass-houses, potteries, ironworks, and collieries in its neighbourhood. Its name is derived from the small River Rother, which joins the Don at this point, and it lies partly on the adjoining hills, and partly in the valley of the Don, which is here navigable.

Fig. 2.—Rotherham Electricity Works, No. 2 Station.



FIGS. 3 AND 4.—SECTIONAL ELEVATIONS AND PLAN OF NO. 2 STATION, ROTHERHAM.

In the neighbouring district an abundance of coal and ironstone is found, which enabled Rotherham to acquire fame for the manufacture of edge tools many centuries ago; ironstone mines, smelting furnaces, and forges were worked as early as 1160. The manufacture of iron and steel is still carried on in the district on a large scale, especially at Masbrough and the Holmes; at the important works founded at Masbrough by Samuel Walker a century ago, cast and wrought iron products were turned out in large quantities, and at the present day wheels and axles and other railway iron work are manufactured at several large works, one of which (Parkgate) also produces armour-plate for warships.

Rotherham is situated in the South Yorkshire coal area, and the power station is close to some of the newest and most up-to-date collieries, capable of a large output. During the past few years the large steel works and rolling mills have been very considerably extended, and new works destined to embark in the heavy iron and steel trade are being erected at an extremely rapid rate.

The remarkable growth of the electricity undertaking is

due to the desire of the municipality to meet the greatly extended needs of the community within the electricity supply area, which includes not only the county borough of Rotherham, but also the urban districts of Rawmarsh and Swinton. Arrangements are also in progress to give a bulk supply to the Yorkshire Electric Power Co. and the Sheffield Corporation as the need arises, with a view to intercon-

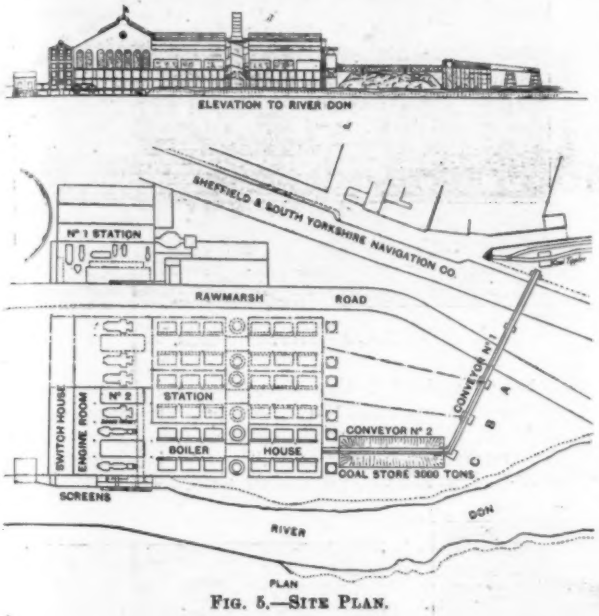


FIG. 5.—SITE PLAN.

The lay-out of the station is shown on the accompanying plan, fig. 5, from which it will be seen that whereas the

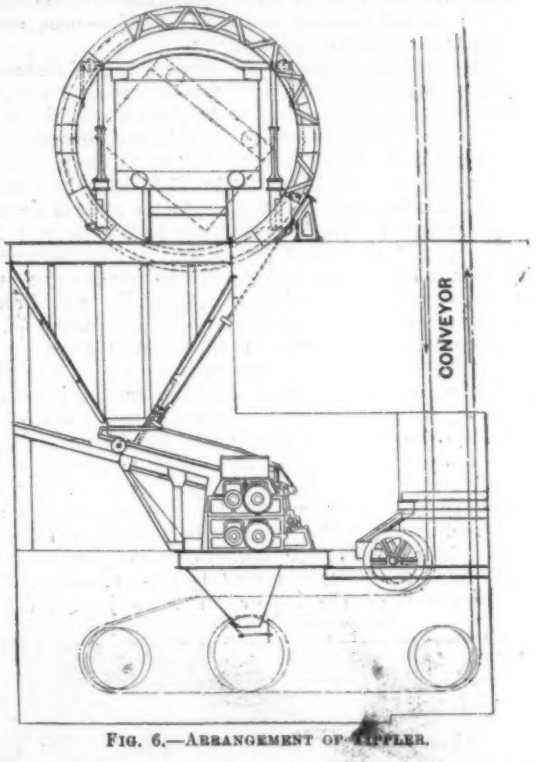


FIG. 6.—ARRANGEMENT OF TIPPLER.

nection between the three systems and possible mutual assistance, on the lines of the Electricity Commissioners' views.

It is estimated that after the completion of the new power station the output for the first complete year will be 100,000,000 units, and with an area of supply comprising 100,000 inhabitants, the consumption per capita will reach the unprecedented figure of 1,000 units per inhabitant per annum.

old station, No. 1, was built alongside of the canal, the new one is on the bank of the river. The section of No. 2 station which is now in being (figs. 2—5) consists of a spacious engine-room, containing the three turbo-alternators, and two boiler-houses with two steel smoke-stacks between them. The existing generating plant constitutes rather more than one-third of the ultimate capacity, and the boiler plant exactly one-third. It will be noticed that the coal siding ends on

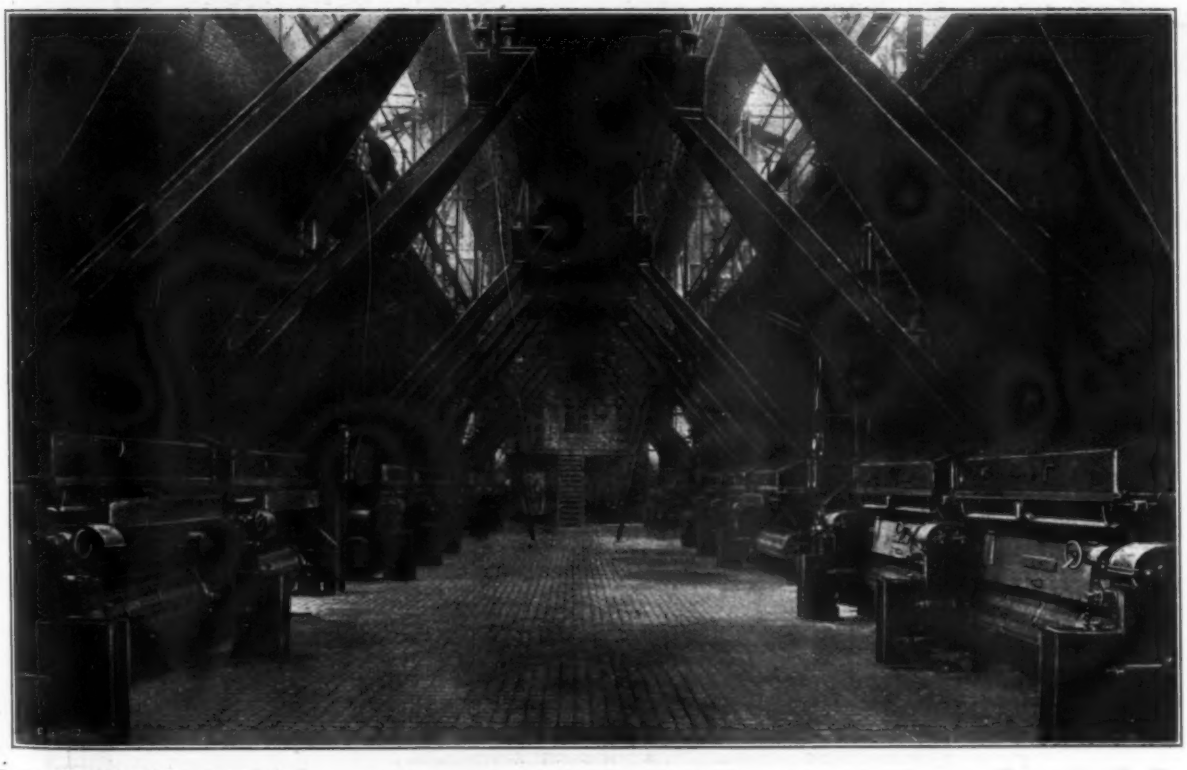


FIG. 7.—INTERIOR OF BOILER-HOUSE, ROTHERHAM.

FIGS. 3 AND 4.—SECTIONAL ELEVATIONS AND PLAN OF NO. 2 STATION, ROTHERHAM.

the remote side of the canal, and that the coal is carried by a double conveyor over an open-air coal store to the existing boiler-houses. Water is derived from the river through a double culvert passing under the turbine-room, and is discharged through a single culvert.

The buildings consist of self-supporting steel structures, filled in with brickwork, except in the case of the switchgear annexe, which consists of brickwork, with floors and roof of reinforced concrete. The principal dimensions are as follows:—Each boiler-house, 112 ft. × 80 ft. × 84 ft. high; engine-room, 132 ft. × by 87 ft. wide between the crane columns, and 110 ft. high to the ridge of the roof, together with a pump-room extension 35 ft. wide × 132 ft. long. Messrs. Babcock & Wilcox, Ltd., were the contractors for the main buildings, boilers, and coal-handling plant, subletting the structural steel work to Messrs. Heenan & Froude, Ltd.; the switchgear annexe was built by Messrs. W. H. Treherne, Ltd., of Rotherham; and the whole of the foundations were laid by the Corporation.

The coal-conveying plant embodies several interesting features. The total distance from the end of the boiler-house to the railway siding is over 500 ft., the conveyor passing over a road and the canal. Coal received in trucks is discharged into a low-level hopper by a Babcock and Wilcox tippler fitted with hydraulic clamping rams; a capstan driven by a 10-H.P. motor is provided for handling the trucks, while a 12-H.P. motor drives the pumps for the tippler, and the latter is turned by a 5-H.P. motor. The coal passes from the hopper on to a jigging screen, whence the small coal is delivered to the conveyor through a filler; the large coal is put through a four-roll coal-breaker, capable of dealing with 100 tons per hour, before passing to the filler (fig. 6). The breaker is driven by a 55-H.P. motor. The conveyor (fig. 11) is of the Babcock and Wilcox gravity bucket type, and is carried at a height of 33 ft. across the canal and roadway by a lattice girder bridge on five trestles. The coal can be tipped at each of the last three trestles—at A (fig. 5) (temporarily) into a bunker for No. 1 station, at A and B for the future boiler houses, and at C for the existing boilers. At C an automatic filler is provided through which the coal is passed into the second conveyor, which is inclined to the first at an angle of 116°, and passes at a height of 23 ft. over an open coal store 160 ft. long before rising to a height of 70 ft., and traversing the boiler houses. The conveyor chain returns by the same route, the coal being discharged at 10-ft. intervals into bifurcating shoots, which deposit it in the bunkers clear of the empty buckets, as shown in fig. 8. On leaving the boiler house the empty buckets pass through a tunnel under the coal store, which is built of concrete with a hopper bottom, so that the coal can be fed into the buckets by means of a travelling filler. This method has the advantage of removing coal from the bottom of the heap—which has a capacity of 3,000 tons—so that spontaneous combustion can be guarded against. No. 1 conveyor is driven by a 30-H.P. motor, and No. 2 by a 40-H.P. motor.

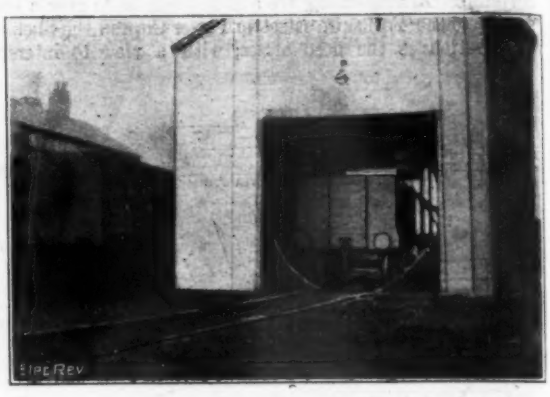


Fig. 9.—Tippler House.

Fig. 8.—Conveyor, over Bunker.

Fig. 10.—Steel Smoke Stacks.

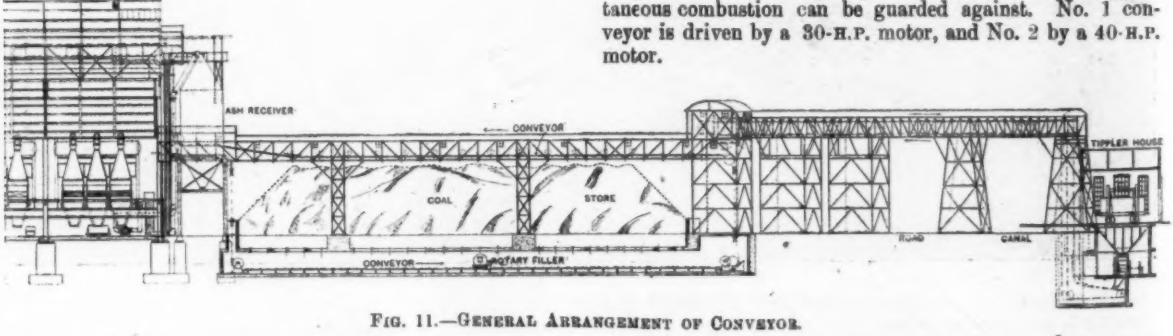


Fig. 11.—General Arrangement of Conveyor.

The overhead bunkers are of steel plate, lined with brick, and are capable of holding 1,000 tons in each boiler house.

Care is taken to regulate the speed of the two conveyors,

so that the flow of coal is uniform, and push-buttons are provided at numerous points on the line to enable the conveyors to be stopped instantly in the event of any mishap.

The boilers (fig. 7) are of Messrs. Babcock & Wilcox's marine type, with a rated evaporation of 45,000 lb. per hour each; there are six boilers in each section of the boiler house, three a side, each fitted with three chain-grate stokers, which are fed by shoots from the bunkers. The boilers are

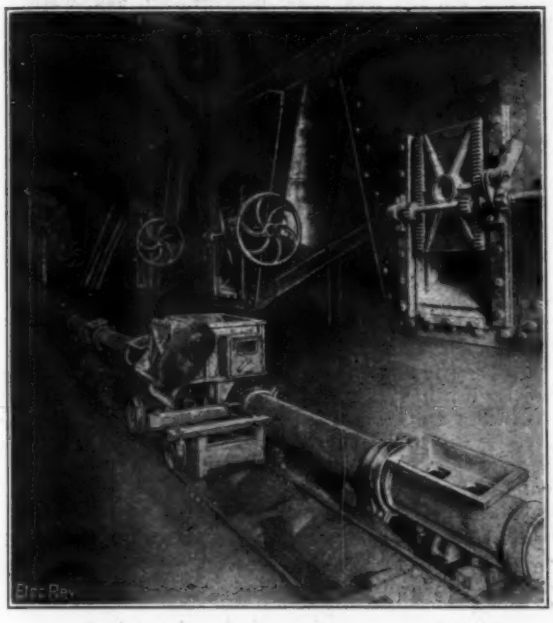


Fig. 12.—Ash-pits and Breaker.

provided with integral superheaters, and above them are horizontal-tube economisers, surmounted by graduated flues leading to the chimney shafts, each of which serves two sets of three boilers. A vertical transverse partition in each shaft divides it into two flues, and horizontal diaphragms divide these again, so that the waste gases from a set of boilers can either be passed directly into the chimney under natural draught, or through fans in the basement (the normal condition). These fans are of the Sirocco type, each driven by a Westinghouse motor of 150 B.H.P. The chimneys (fig. 10) are of

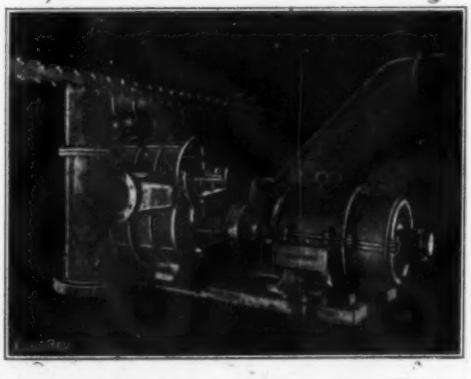


Fig. 13.—Rotary Exhauster.

steel plate, 20 ft. in diameter at the bottom and 14 ft. at the top, and are 113 ft. high from the ground level, which is 13 ft. below the firing floor. The horizontal flues over the economisers are carried on steel rollers, supported by the framing of the building.

From the grates the ashes fall into ash-pits in the basement, whence they can be discharged into ash-breakers running on a line of rails under each set of boilers (fig. 12). These breakers are each driven by a 7-B.H.P. motor. Thence the ashes are carried away by a pneumatic exhaust system through 10-in. cast-iron pipes to receivers mounted at the end of No. 2 boiler-house, in which a vacuum of 5 in. of mercury is maintained by rotary exhausters, one of which is shown in fig. 13. The ashes are quenched with a water spray as they enter the receivers. The suction pipe also carries off the soot from the economisers and chimneys, which is brought to the 10-in. pipes by separate ducts. The exhausters are driven by 70-B.H.P. Westinghouse motors.

In the basement, under the boiler fronts, is installed the shafting which drives the stokers; each line of shafting, serving three boilers, is driven through gearing by a 12-B.H.P. motor at each end, one of these motors being a stand-by.

Make up feed-water is derived from the town supply, being stored in a tank between the chimney stacks. The boiler feed pumps are situated in the engine room, together with the hotwells; they are of Weir's turbine-driven single-stage rotary type, exhausting directly into the hotwells through exhaust nozzles, or alternatively to atmosphere, in cases of emergency. Six pumps are provided, each capable of delivering 350,000 lb. of water per hour (fig. 14). Close to the feed pumps are two Rees Roturbo centrifugal pumps driven by 29-B.H.P. Westinghouse motors, and each capable of delivering 180 gallons of water per minute under a head of 300 ft., for operating tube cleaners of the water-turbine type and other purposes.

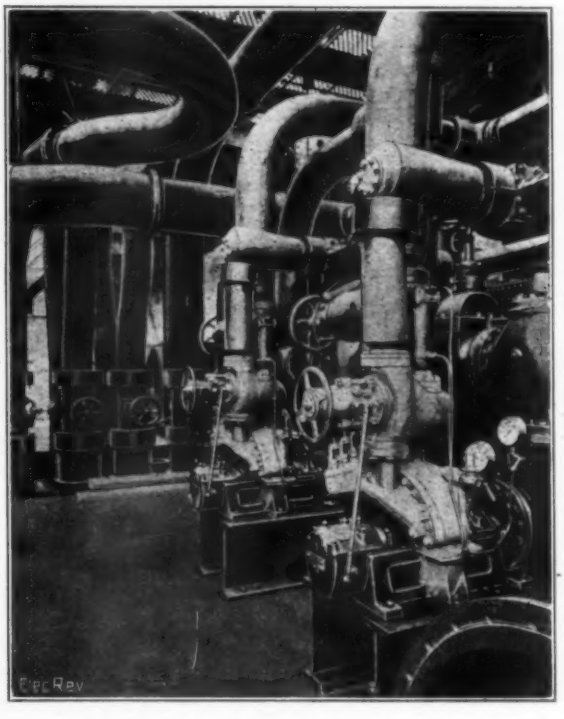


Fig. 14.—Feed Pumps and Steam Piping.

The hotwells are mounted on a gallery next to the boiler-house wall, and are each equipped with a Lea recorder measuring tank.

The steam mains consist of two headers running the whole length of the boiler houses on each side, and coupled by expansion bends between the sections. In the engine room they enter steam receivers, from which a 14-in. pipe leads to each of the 12,500-KW. turbines, and two 14-in. pipes to the 30,000-KW. turbine. These pipes, with the feed pumps, are seen in fig. 14.

(To be continued.)

Bauxite in Germany.—Five German bauxite mines in Hessen have been amalgamated into the Bauxite Works Co., of Frankfort-on-Main, with a share capital of 7,000,000 marks, of which 1,500,000 marks has been taken over by Dutch interests.

ELECTRICITY AND HOUSING.

THE BILLINGHAM HOUSING SCHEME.

At a time when so many housing schemes are under consideration, it is thought that a concrete example of what is actually being done in one district will be of wide interest. The following notes are, therefore, presented in the hope that the particulars given therein will be useful to housing authorities generally, and to others interested in the subject.

Too often in the past little interest has been shown in housing schemes by the general public, the consequence being that frequently such schemes were approached more from the point of view of the speculative builder than from that of the needs of the prospective tenant. There were, of course, notable exceptions, but, more often than not, the provision of facilities for introducing labour-saving devices into the house was either ignored altogether, or made in such a manner as to be almost useless, and the tenant was consequently put to considerable expense after the house was finished if he wished to take advantage of modern labour-saving devices; so he frequently did without them.

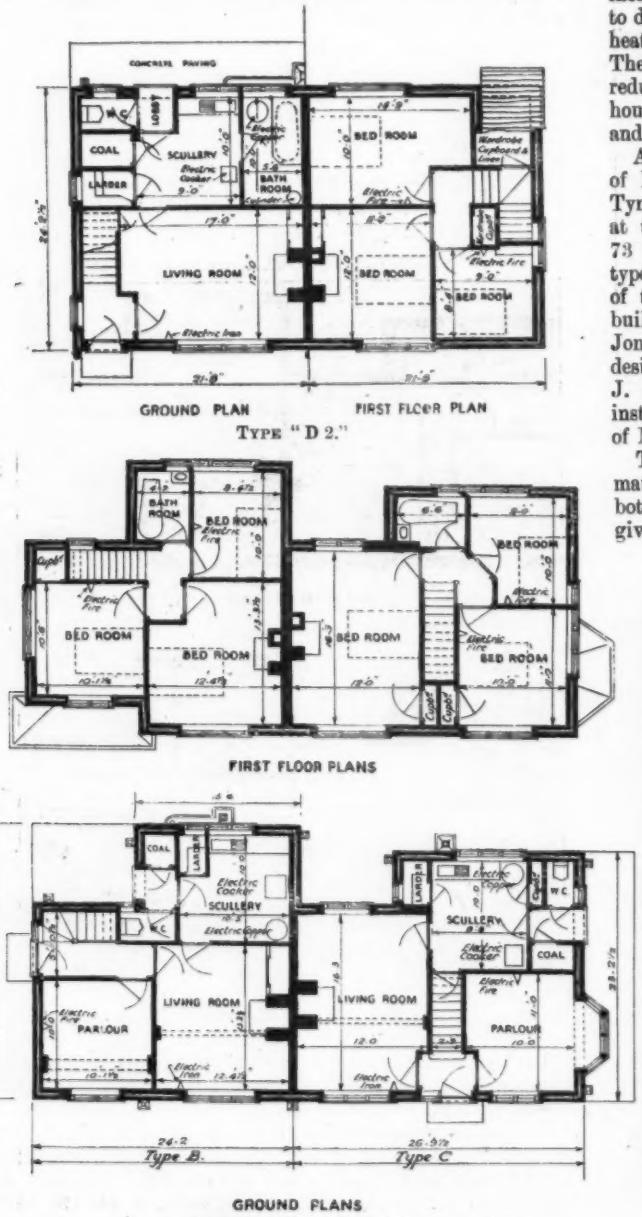


Fig. 1.—Ground and First-floor Plans of Billingham Houses.

This point, however, is not being overlooked in the housing schemes now under consideration, and, wherever possible, provision is being made for the use of electricity with the consequent elimination of dirt and waste, effecting a saving of labour, and, what is also important, increasing the available room space. Electric lighting permits of the use of low ceilings, because, owing to the small amount of heat generated, electric lamps can be fixed within a few inches of the ceiling. Electric heating makes it possible to dispense with flues, fireplaces, fenders, &c., and allows the heaters and cookers to be used in any convenient position. The all-electric house, therefore, means a considerable reduction in the building costs in comparison with the house adapted for the older methods of lighting, heating, and cooking.

A number of houses are now being erected at the village of Billingham, Stockton-on-Tees, by the Newcastle-upon-Tyne Electric Supply Co., Ltd., for the use of its employés at the North Tees power station. For the present only 73 houses are being built; they are of four different types—viz., "B," "C," "D 1," and "D 2," plans of three of the types being shown in fig. 1. The whole of the building work is being carried out by Messrs. Walter Jones & Sons, of London and Newcastle-upon-Tyne, to the designs and under the superintendence of Mr. Leonard J. Couves, of Newcastle-upon-Tyne, and the electrical installation work is in the hands of Messrs. Graham Bros., of Middlesbrough.

The houses are all semi-detached, and are built approximately eight to the acre; provision is made for gardens at both the backs and fronts. Particular attention has been given to the planning of the houses economically, and so as to afford the greatest amount of comfort to the occupiers; the elevations on all fronts, too, are such that the houses, viewed from any point, present a pleasing appearance. The storage and cupboard room is well above the average for this class of house. The main roads run from north to south, thus ensuring a liberal amount of sunshine to the principal rooms of the houses, which face east and west. The boundary and division fences will be formed of thorn

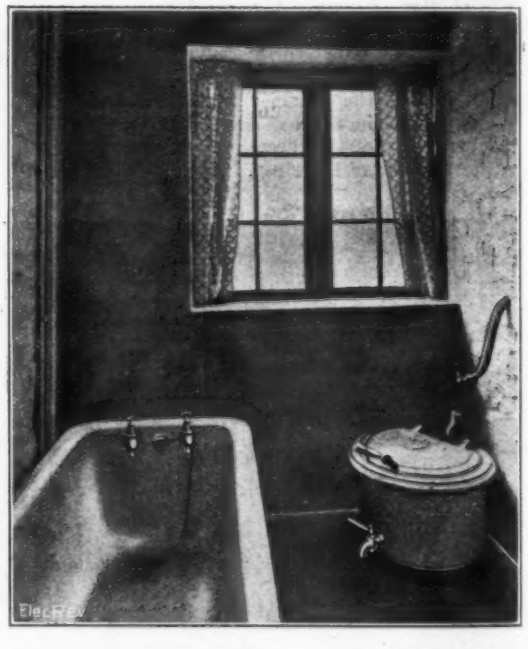


Fig. 2.—Bathroom, showing Jackson Electric Wash Boiler.

and privet hedges, and the planting of trees in the grass margins of the roads will give additional attraction, and at the same time will leave the estate in keeping with its rural surroundings.

Electricity is installed throughout in each house for lighting, heating and cooking purposes; provision is therefore made for only one chimney breast in each house. With regard to the arrangements made for heating the houses, a coal-fired grate is placed in the principal living room in each house; behind the fireplace is fitted a water boiler from which the domestic hot-water supply is taken. At the side of the sitting-room fireplace is a cupboard containing the water circulating cylinder, which conveniently warms the cupboard. The only other fireplace in each house is fitted in the bedroom immediately above the living room, this fireplace having its flue in the same chimney breast as that of the living room below. If desired, one of the portable electric radiators can, however, be used as an alternative in either or both of these rooms. The remainder of the rooms are heated entirely by electricity, each room being provided with a ventilator, but no fireplace; by this means considerably increased space is obtained in the rooms.

One of the smaller "D2" type houses has been furnished for the company by Messrs. Dickson & Bensons, of Middlesbrough, and the various housing authorities in the district have been invited to inspect it. Each house is fitted complete with an electric cooker, electric wash boiler, and electric fire, and provision is made for the tenants to obtain,

Fig. 3.—Scullery, showing Jackson Electric Cooker.

on favourable terms, additional domestic electrical apparatus which they may care to use. A brief description of the house is as follows:—The living room, which is on the ground floor, is the largest room in the house, and contains the fireplace and water boiler as described above. In addition there is a wall socket for electric heating purposes, fixed in such a position as to be most convenient for supplying an electric iron or other domestic apparatus. The room is semi-directly lighted by a bowl fitting of plain but neat appearance.

In the scullery, behind the sitting room, is fitted a large sink with hot and cold water laid on, and the electric cooker is installed as shown in fig. 3. It is of the Jackson No. 21 type, and has an oven measuring 20 in. by 13 in. by 15·5 in.; it is loaded to 2 kw., and controlled by a three-heat switch. In addition, the cooker is fitted with a rectangular hot plate loaded to 1·4 kw., and a self-contained boiling pan of 6 pints capacity with a draw-off tap. Over the pan, as shown in fig. 3, are mounted two steamers for cooking vegetables, &c. Between the hob table and the oven is a grill and hot cupboard.

Adjoining the scullery is the bathroom, also with hot and cold water laid on, containing the electrically-heated clothes boiler shown in fig. 2. Its capacity is 10 gallons, and it is loaded to 3 kw. The domestic hot-water supply is laid on direct to the boiler from a tap, which is shown in the illustration, immediately above the wash boiler. It is only necessary, therefore, to raise the temperature of the water, say, 50° or 60° by electricity to attain boiling point. The wash boiler is controlled by a three-heat switch, so that the water can be kept at boiling point with a small consumption of electricity.

There are three light, airy, bedrooms in the house, and each is provided with a Jackson portable electric radiator of neat appearance, loaded to a capacity of 1, 1·5, or 2 kw., according to the size of the room; each radiator is controlled by two switches.

As regards the service arrangements, electricity is supplied at 250 volts, 40 cycles, single-phase, and a three-wire service is laid to each pair of houses; each house is connected across one phase and neutral, the distribution being on the three-phase, four-core, system. The estimated consumption of electricity per annum is:—For class "C" houses, 3,780 units; and for classes "B" and "D," 3,480 units.

A demonstration was recently carried out with the actual type of electric cooker to be used at Billingham before the members of a local housing committee, and the interesting results are set out below. The following items, sufficient to provide a meal for six persons, were cooked:—A sirloin of beef, weighing 3 lb. 12 oz.; potatoes, weighing 0·25 stone; two cauliflowers; a Yorkshire pudding; and a rhubarb pie. The heating of the oven to cook the meat was done as follows:—

Heat.	*Time.*	*Consumption.*
Full	15 minutes	0·5 unit.
Medium ...	30 "	0·5 "
Low	70 "	0·583 "
Totals	1 hr. 55 mins.	1·583 units.

And for cooking the pudding and the pie as under:—

Heat.	*Time.*	*Consumption.*
Full	15 minutes	0·5 unit.
Medium ...	25 "	0·42 "
Low	20 "	0·17 "
Totals	1 hr. 0 min.	1·09 units.

In the above test the cauliflowers were boiled in the boiler and the potatoes were steamed over it; five pints of water were boiled from cold and the vegetables cooked in one hour with a consumption of 0·6 kw., making a grand total of 3·27 units for the whole meal for six persons. An item of particular interest was that the shrinkage of the meat amounted to only 11·7 per cent., which for frozen meat is a result that could be obtained with no other method of cooking.

The Newcastle-upon-Tyne Electric Supply Co., Ltd., will be pleased to supply further information with regard to the houses described above upon application.

Canada's External Trade.—Figures regarding the trade of Canada are quoted from the Report of the Canadian Department of Trade and Commerce for the fiscal year ended March 31st last, by the *Board of Trade Journal*. It is shown that imports were 72 per cent. above the pre-war figure, while exports increased by 187 per cent. The totals are given below and details of trade with the British Empire and other countries are shown. The amounts in every case are given in Canadian dollars.

	1914.	1919.	1920.
Total exports ...	455,437,224	1,268,765,285	1,286,658,709
" imports ...	618,457,144	916,429,335	1,064,516,160
Excess of imports over exports	163,019,920	—	—
Excess of exports over imports ...	—	352,335,950	222,142,540
Exported to:—			
United Kingdom ...	215,253,969	540,750,977	489,151,806
British Empire ...	23,388,548	64,408,812	72,635,353
France	3,632,444	96,103,142	61,106,938
Germany	4,044,019	—	610,528
Japan	1,587,467	12,245,489	7,732,514
United States ...	163,372,825	454,873,170	464,029,014
Imported from:—			
United Kingdom ...	182,070,362	73,035,118	125,969,330
British Empire ...	23,456,440	50,636,422	47,935,679
France	14,276,535	3,632,900	10,609,125
Germany	14,586,223	75	44,259
Japan	2,604,216	13,618,122	13,635,771
United States ...	395,565,328	746,920,654	801,605,444

OUTDOOR E.H.P. TRANSFORMERS.

By D. MACBEAN.

In a recent issue of the Electrical Review, and in connection with a paper on "Mains Distribution," mention was made during the discussion of a daring type of sub-station in which the transformers were placed out-of-doors, and merely protected by an ample roof. It may be of interest to give details of an installation of this kind laid down in January, 1916, which, up to the present time, has given every satisfaction.

With a view to meeting somewhat unusual conditions it was decided to install an additional 3-phase turbo-alternator for which a generating pressure of 2,500 volts was chosen. To permit of parallel running with existing sets it was necessary to step-up this pressure to 11,000 volts, and after consideration, three single-phase, 710-k.va., oil-cooled transformers were installed.

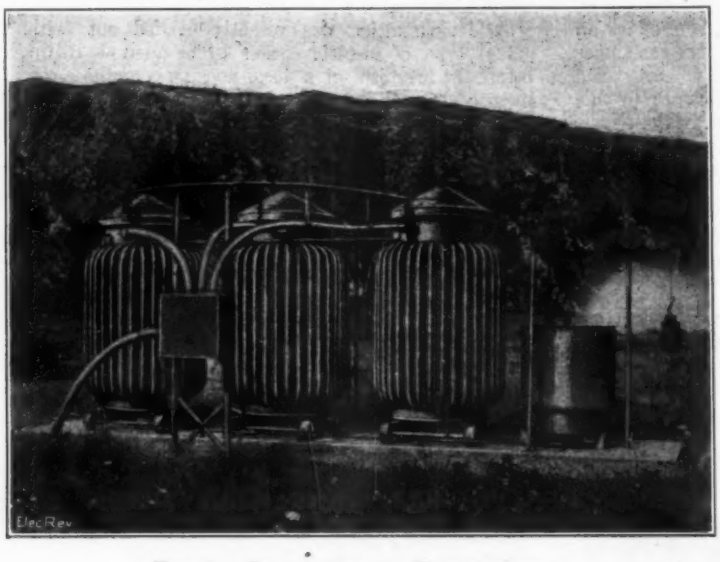


Fig. 1.—Out-door e.h.p. Transformers.

While waiting for the plant the question of suitable housing arose, and although from the point of view of connections and switchgear, it would have been advantageous to have the transformers inside the power house, it was considered better on grounds of safety to install them out-of-doors in a separate building, all controlling gear, however, being kept indoors.

It was desirable to keep all connections as short as possible, so the choice fell on a plot of ground immediately outside the power house and in line with the turbo set. The only apparent disadvantage of the site lay in its proximity to a Harrison cooling pond (the spray from which may be seen in the first illustration), which with certain directions of wind sent over water in sheets.

For this reason it was at first felt that nothing short of a substantial brick building, with a thoroughly watertight roof, would do. When considering the size of this building, the deciding factor was the method of ventilation to be adopted; it was considered that artificial ventilation alone could not be counted on with safety to get rid of the heat losses, which at full load amounted to roughly 30 kw. Natural ventilation with the usual bottom gratings and the little-met-with, but highly serviceable, draught-inducing chimney pointed to a building of some 2,000 cu. ft. capacity. It appeared, however, on account of the proximity of the cooling pond, that the ingress of excessive moisture could not possibly be avoided with any type of building which would guarantee the necessary change of air, and as a building was costly, even in those days, it was felt expedient to see how far it might be dispensed with altogether, and an open-air installation adopted.

It was appreciated that there would be little difficulty in making special water-tight glands where the cables entered the transformers, or bringing down the 40-in. diameter top-cover joint sufficiently tightly to prevent access of moisture, so the manufacturers were asked whether the transformer cases would stand the 7- to 8-lb. pressure consequent on heating from internal and external sources. They, however, declined to assume any responsibility in this direction, stipulating that their transformer cases must run at atmospheric pressure.

The idea of a reservoir, large enough to keep the resulting air pressure within small limits, was considered and discarded; working along these lines, however, the gasometer principle was ultimately adopted. The chamber was made up in cylindrical fashion out of 1/16-in. sheet zinc, both top and bottom sections having annular partitions as shown in fig. 2, for the purpose of oil sealing. The movable portion was counterbalanced by a weight, which was supported by means of a very flexible steel wire running over light wheels mounted on ball bearings.

The air spaces above the oil level in the transformers were coupled up to a common header leading to the bottom of the gasometer by means of ¾-in. piping, and considerable attention was paid to the pipe joints; tee pieces and plugs, to allow access for rodding or cleaning, were provided, although so far no trouble has been encountered in this direction. The size of the gasometer was arrived at by means of the well-known P.V. law. The actual capacity is 14 cu. ft., which gives a margin of roughly 25 per cent. on full load on the hottest summer day. The appended sectional sketch, fig. 2, shows the construction of the gasometer, which is perfectly automatic in its action.

The transformers were dried out *in situ*. The dielectric strength of the oil was noted, and has shown no diminution; the insulation resistance also remains at its original high figure. The ventilation of the transformers being perfect, they run at a very low temperature, and the deterioration of the oil is much less rapid than that observed in other transformers in enclosed sub-stations.

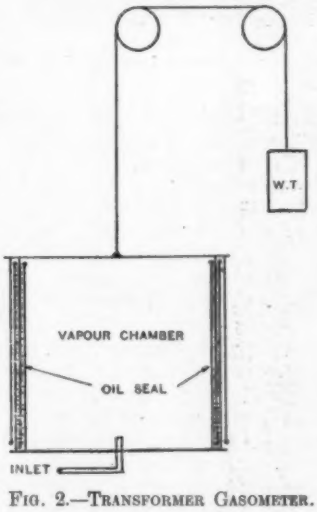


Fig. 2.—Transformer Gasometer.

Fig. 1 shows the general arrangement, sealing chamber, glands, &c., provision being made for the removal of the centre transformer if necessary by fixing the upright carrying the e.h.p. pot-end, in sockets from which it can easily be withdrawn.

EXTENSION OF UNEMPLOYMENT INSURANCE.

By JOS. J. H. STANSFIELD, F.C.I.S.

The Unemployment Insurance Act, 1920, which comes into operation on November 8th, 1920, amends the existing scheme and extends compulsory insurance against unemployment to substantially all persons in respect of whom Health Insurance contributions are payable other than outworkers, persons employed in agriculture, and private domestic servants.

Many will no doubt remember the difficulties caused by the first Act which dealt with unemployment insurance in consequence of that Act scheduling certain trades and work carried on under certain conditions. In effect, many workers were insurable or not insurable according to whether the work they were engaged on was chargeable to capital or revenue, and in previous issues of the Electrical Review there were recorded a large number of decisions made by the umpire whose duty it was to consider the intricate points which often arose.

The new Act makes a clean cut, and with certain exceptions, all employed persons (male or female) of 16 years of age and upwards, including persons over 70, unless they are in receipt of an old age pension, must obtain unemployment books issued by the Ministry of Labour, and every employer must obtain an unemployment book from every such person in his employ on November 8th, 1920, and from every such person whom he may afterwards employ.

If not already obtained, an application should be made without delay to an Employment Exchange or branch employment office of the Ministry of Labour, as on and after the date above named all insurable persons who are employed without having or at once obtaining unemployment books, and the employers of such persons, will be liable to penalties.

As in the case of Health Insurance, there are certain excepted employments, and these include employment under a local authority, in the service of any railway company or public utility undertaking for the supply of gas, water, electricity, or hydraulic power, or of a canal, dock, or tramway undertaking, and any employment in which the employed persons are entitled to rights in a statutory superannuation fund where the Minister of Labour certifies that the employed person is not subject to dismissal except for misconduct or neglect of or unfitness to perform his duties, and that the terms of the engagement make insurance against unemployment unnecessary. Forms of application for the necessary certificates required under this provision can be obtained from the Ministry of Labour, Employment Department, at Queen Anne's Chambers, London, S.W. 1, and if there is any doubt whether contributions are payable in respect of any employé the employer should obtain a definite decision from the Minister of Labour, for which forms of application (U.I.A.1) are or shortly will be available. It should be stated that the decision of the Minister of Labour is not necessarily final, as an appeal may be made to the High Court by any aggrieved person.

The employer will be responsible for the custody of the unemployment book as long as the employed person remains in his service, and for affixing stamps thereto, but must allow the employé reasonable opportunities of inspection.

Special arrangements may be made for stamping the books of persons regularly employed at intervals of 14 weeks or such shorter intervals as may be agreed, or for stamping the books in the week after payment of wages, and any employer wishing to make such an arrangement should apply for the appropriate form (U.I.A.170 or U.I.A.78) to the Employment Department of the Minister of Labour at the before-mentioned address.

Special unemployment insurance stamps will be on sale at all Post Offices, no other stamps being usable. These stamps may be obtained in rolls for use in the hand stamping machines which are rapidly coming into favour where there are many employés.

The contributions payable from November 8th are higher than those previously payable, and stocks of stamps of the old values remaining on hand may for a strictly limited period be exchanged *pro rata* at any Post Office for stamps of the new values.

As it is desirable that the provisions of the new Act should be known as soon as possible, employers are invited to exhibit posters or to distribute leaflets to their employés, which may be obtained free of charge from any Employment Exchange or branch employment office of the Ministry of Labour.

It is the duty of the employé to obtain the unemployment book, and a considerable amount of extra work will be thrown upon the Unemployment Exchanges. To avoid this as far as possible the exchanges are open to make arrangements with employers to obtain from the employé the form of application necessary, and so avoid a personal application to the exchange. This is a convenience which will be appreciated by the employés, and no doubt many employers will agree to assist the exchanges and so avoid the long queues, which have previously gathered together under somewhat similar circumstances, particularly as many exchanges are now working with depleted staffs.

Unemployment books current for 1920-1921 will be available for use after the new Act comes into force, but they must, of course, be stamped at the new rates.

LEGAL.

Plymouth Corporation Fined.

On October 13th, the Town Clerk of Plymouth appeared before the Plymouth magistrates to answer a charge against the Corporation of infringing certain regulations made under the Factory and Workshop Act and the Electricity Code. Mr. Joseph Owners, Inspector of Factories, prosecuted, and Mr. G. Scott-Ram, Chief Electrical Inspector of Factories, also gave evidence.

The charge arose from the circumstances under which Richard Prout, an employé at the electricity works, sustained injuries due to an electric shock. Mr. Owners stated that Prout was cleaning the apparatus in high-tension cubicles at the power station, one of which was fixed at some height above the ground. He put on gloves and mounted a chair to reach the gear, and while cleaning some insulators with a duster, his unprotected upper arm came into contact with some busbars carrying alternating current at 2,000 volts pressure. Both his arms were severely injured, and Prout had been unable to work since the occurrence. The Corporation had not provided the necessary equipment to isolate parts of the apparatus while being cleaned, and had also failed to employ the only alternative, *i.e.*, to close down the whole of the plant. Under examination Prout said he had never been provided with a stick to reach the higher apparatus, although he sometimes used one of his own, but he considered that the cleaning could not be carried out properly by this means. Mr. Scott-Ram said that at Coventry, where the plant was six times the size of that at Plymouth, the station was shut down for half an hour or so for cleaning. He thought that even if a stick were used a serious accident was possible. The use of a chair to reach the parts in question was also highly dangerous, as the chair might easily slip. Mr. E. G. Okell, the Plymouth electrical engineer, said that if the standing instructions regarding cleaning had been carried out the accident would not have occurred. The present precautions had been sufficient to prevent accidents for the 20 years during which the plant had been in operation. Extensions were now in progress, which would enable the safety regulations to be complied with implicitly. Several witnesses who had cleaned the switchgear on previous occasions testified to having carried it out without mishap.

The Chairman said that the Bench considered that a technical offence had been committed, but the man had also failed to obey standing instructions. The Corporation was fined £5.

Coal-cutting Machine Fatality.

In consequence of a fatal accident at Baton Colliery, Shotts, in March last, when a miner died from injuries inflicted by an electrically-driven coal-cutting machine, the Crown prosecuted Edward Somerville, the manager, John Elder, the electrician, and John Murray, colliery overman. Proof in the case was led at Hamilton recently, and Sheriff Shennan

has now issued his judgment. He convicts all three respondents of failure to discharge fully their respective duties in connection with the installation and protection of the machine so as to prevent danger. The manager and electrician are fined £3 each, and the overseman £2.

Breach of the Factory Act.

At Halifax, last week, Mr. Joseph Henry Gath, of the Electrical Engineering Co., Horton Street, was fined £1 for failing to notify the District Inspector of Factories of an accident that occurred at the factory in July, and he was also fined 5s. for failing to exhibit a prescribed abstract of the Factory Act on the premises. He had also to pay 5s. costs in each instance.

Mr. H. W. Younger, the Factory Inspector, said that on July 12th a workman injured his thumb in some machinery, and was absent three weeks. He (the inspector) did not hear of the accident until three weeks later, in the course of a routine visit to the factory. Even then the firm was given opportunity to rectify the matter, but took no notice of the offer.

Defendant, pleading guilty to a technical offence, said the accident was of such a trivial nature that it was not considered necessary to report it. The failure to exhibit the Factory Act was an oversight, and had since been made right.

Marconi's Wireless Telegraph Co. v. Hamilton.

In the Chancery Division on October 20th, Mr. Justice Lawrence had before him this case, in which the plaintiffs sought an injunction restraining Mr. J. W. Hamilton from publishing any of the pleadings or documents in an action commenced by him on June 4th, 1919, in the King's Bench Division, or any of the documents or correspondence relating to the matters in question; and also from publishing an agreement dated May 3rd, 1920, made between the defendant, the plaintiff company, and Mr. Godfrey Charles Isaacs.

After the case was opened and preliminary arguments by counsel had been heard, the parties came to terms. Mr. Godfrey Isaacs and the company unreservedly withdrew all charges against Mr. Hamilton, who gave a perpetual undertaking not to publish, either directly or indirectly, any of the documents referred to. Each party would pay its own costs.

Claim for Supply of Electricity.

Mr. Justice Roche, in the King's Bench Division, on October 21st, heard an action in which the Bournemouth and Poole Electricity Supply Co., Ltd., claimed from Messrs. Hiel, Richards & Co. £297 10s. 8d. for electricity supply.

Mr. R. Goddard, for the plaintiffs, said the defence, as he understood it, was first, that they had not been paid the amount due by another company which succeeded them in the business at Poole, and that the plaintiffs had accepted the successors of the defendants, the Gardner Shipbuilding Co., as consumers in place of defendants. Messrs. Hiel, Richards and Co. were doing concrete shipbuilding at Poole harbour, and by agreement dated February 26th, 1918, they agreed to take a supply of electricity from the plaintiff company. The defence which was set up now was not set up until they were pressing Hiel, Richards & Co. The date on which the company commenced to take the supply and from which their agreement ran was April 16th, 1918, and it went on till December, 1919. It was common knowledge in Poole that Hiel, Richards & Co. might be disposing of the business to the Gardner Co., but no application was made by any one down to December, 1919, that the Gardner Co. should be substituted for defendants as consumers. The defendants sent a cheque for £27 12s. to cover what was due to the end of July, 1919, and with regard to the period ending September 29th, for which £190 14s. was due, the defendants wrote that they had made arrangements with the Gardner Co., and had forwarded a cheque to them to cover the amount due from them.

In reply to a letter from plaintiffs inquiring if defendants regarded their agreement with them as terminated, the defendants wrote: "We think it best that all accounts in future for the supply of electricity should be rendered to the Gardner Shipbuilding Co., as we are making arrangements with them." Upon receipt of that letter the plaintiffs sent forms to the Gardner Co. inquiring whether they wished to become consumers instead of defendants. Those forms were sent in December, and were not received back from the Gardner Co. until the middle of February. Meanwhile they sent in an account to Hiel, Richards & Co. for the December quarter, and on February 6th they got a letter from the Gardner Co. stating: "We enclose herewith our cheque for £162 10s. 3d. and one from Hiel, Richards & Co. for £88 17s. 7d., making a total of £251 7s. 10s., the amount of your account to December 21st, 1919." At that time the plaintiffs had not a consumer's account with the Gardner Co., and those two cheques were credited in their ledger to Hiel, Richards & Co.

Mr. Johnson, for defendants, said the situation was that they were clearing up at the time and occupied only a very small part of the premises for a few weeks. He contended that the letters of the defendants amounted to a notice to discontinue the supply to them, and the account had been paid down to December 22nd.

His Lordship, in giving judgment, said the amount claimed was in respect of the quarter ending March 29th, 1920, and was regulated by the agreement entered into by the plaintiff company with the defendant company. He had no doubt that notice was not given or accepted terminating that agreement.

Judgment was entered for plaintiffs for the amount claimed with costs.

Poulsen's Patent; Application for Extension.

A patent granted to Valdemar Poulsen (No. 15,599 of 1903) was the subject of an application to Mr. Justice Sargant in the Chancery Division on Wednesday (19th). The applicants were Mr. Christopher Hage, of 143, Stockholmsgade, Copenhagen, the British and Overseas Engineering Syndicate, Ltd., 4, Old Burlington Street, and the Poulsen Wireless Telegraph Co., Ltd., Marconi House, Strand.

Mr. Trevor Watson, for the applicants, said this was an application under section 7 of the Patents Act, 1919, for an extension of Poulsen's letters patent. The rules of Court provided for the fixing of an "appointed day," and the Master in Chambers on Sept. 2nd fixed the 19th inst. as the appointed day. In the meantime a notice of opposition had been put in by Mr. Frank Elwell, and the Board of Trade had also given notice of objection. He had now to ask his lordship to give directions for the delivery by the opponents of particulars of their objections to the prolongation of the patent.

Mr. Courtney Terrell said he appeared for Mr. Elwell and also for the Radio Communication Co., and he would like to have some weeks to get out the particulars. He submitted this was not a case to be tried on affidavit evidence. It would be a long controversial case, and the opponents would probably allege that the applicants instead of being damaged had profited by the war.

Mr. Austen Cartmell, for the Board of Trade, said the case was an extremely important one, and the Law Officers would be briefed to deal with it; consequently he asked that some time should be given before the hearing.

His Lordship decided that the case should not be heard before the first day of next sittings, and gave the opponents six weeks to prepare the particulars of objections.

Missing Cable.

A man named J. J. Barratt, in the service of the Ministry of Munitions Disposal Board, was charged at Beverley on Saturday with stealing about 75 yards of electric cable, value £56, from the Beverley Aerodrome, and J. V. Bell, electrical engineer, of North Bar Street, Beverley, was charged with receiving the same, knowing it to have been stolen. The prisoners were remanded, and were allowed bail each in £50 and one surety each in £50.—*Leeds Mercury.*

Automatic Sub-Stations.—Stations that are substantially automatic in action have been alluded to in our columns from time to time, but the *Electrical World*, of August 28th last, describes what seems to be quite the nearest approach to a reasoning mechanism that has yet been devised. The mechanism in point is that of several automatic industrial sub-stations for the big plant of the Packard Motor Co. at Detroit. The plant had quite outgrown the economic range of its own D.C. system, so that the situation was met by taking three-phase energy at 4,600 volts from the central station and setting up at strategic points along the D.C. bus system automatic motor-generator sub-stations, each of 1,500 K.W. capacity. The sensational feature of the installation is not, however, in the unusual size of the automatic units, but in the application of automatic working to synchronous motor drive, obviously of great importance in a case like this. The sub-station starts, if the D.C. bus voltage is abnormally low for five seconds, by energising the motor through an auto-transformer, bringing it up to synchronism, and then transferring it to the running connection. Then the D.C. generator, having been brought close to the bus voltage, is thrown in and the voltage is adjusted to 250, where it is held up to 125 per cent. of full load, above which point the voltage is automatically lowered until the load is at that limit. Below this point the control is shifted to voltage regulation for 250 volts unless the load drops below 15 per cent. for a predetermined period, when the motor-generator automatically retires from service until again needed. Besides all this there are the usual relays against overload or reverse current on either side, plus protection against overheating of the machines, or their bearings, and overspeed. One must read in detail the various items of this extraordinary system of automatism fully to appreciate it, but its most remarkable feature is the bringing of the big motor into synchronism and full action. This is accomplished by taking advantage in a highly ingenious fashion of the sudden drop of the alternating starting current as the motor falls into synchronism and the simultaneous building up of the exciting current derived from the D.C. machine. The co-operative character of these changes is fully shown in the original article. The situation calling for such an elaboration of automatic devices is a rather exceptional one, but it has been met by a most remarkable display of resourcefulness.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

An Automobile Heat Gauge.

Although not directly electrical and designed chiefly for use with automobile engines, the "Boyce Moto Meter" can be used as an indicator of the thermal condition of transformers. The instrument is made in various types, but consists generally

FIG. 1.—THE "BOYCE MOTO METER."

of a glass tube containing a red liquid which when affected by excessive heating of the engine or transformer, rises to a warning point indicating dangerous heat. MESSRS. DRAKE AND GORHAM WHOLESALE, LTD., 67, Long Acre, W.C. 2, are suppliers of this device.

A Rotary Voltammeter.

Among the many measuring instruments manufactured at the HOYT ELECTRICAL INSTRUMENT WORKS, Penacook (N.H.), is the D.C. voltammeter illustrated in fig. 2. This is a portable instrument measuring only 4¼ in. × 3 in. × 2 in., and combines many novel features not found in any other type. It consists of a commutator, which is stationary, mounted in a suitable receptacle having provision for a number of shunts and resistances, connections with which are made through the several segments of the commutator. A small millivoltmeter is centrally pivoted to the commutator in such a way that the meter terminal makes connection with successive segments as the meter is rotated. A fixed index finger on the side of this meter shows the position of the terminal, and the case is marked with various figures showing the position of the commutator segments. There are six terminals, which give the

FIG. 2.—THE "HOYT" ROTARY VOLTAMMETER.

following ranges: 0-30 amperes; 0-30 volts; 0-3 amperes; 0-3 volts and 0-90 millivolts. In the conventional type of voltammeter where the same moving system is utilised for current and voltage measurements, it is necessary to have two distinct windings on the moving coil and two separate connections or a switch in the moving system circuit to break the ammeter circuit when it is desired to measure voltage. In the Hoyt rotary meter, however, there is but one winding and one pair of conductors from the moving system to the contact terminals, and these consist of two coil springs, which serve the double purpose of carrying the current to the coil and furnishing the controlling force of the movable member. All other coils and shunts are contained in the commutator receptacle each with its own circuit from the binding post to the commutator. The sole agent for this instrument in the United Kingdom is MR. SIDNEY G. JONES, Audrey House, Ely Place, E.C. 1.

Multi-way Pedestal Heaters.

Among the many new designs in electrical heating apparatus being placed on the market by the GENERAL ELECTRIC CO., LTD., 67, Queen Victoria Street, E.C. 4, is a range of pedestal heaters consisting of two, three or four separate bowl fires. This idea remedies what occasionally may be

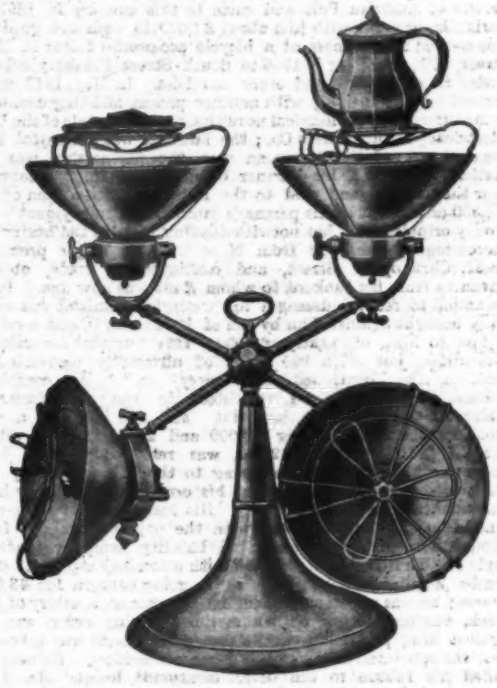


FIG. 3.—THE "MAGNET" FOUR-WAY PEDESTAL HEATER.

thought a disadvantage of the electric radiator, *i.e.*, that its heat is concentrated in one direction only. Each "fire" is arranged so that it may be inclined in any direction giving a general distribution of heat. If desired one or more parts of the device can be employed for purposes other than warming a room. As fig. 3 demonstrates, in the four-way heater two fires may be used as toaster and boiling or warming plate respectively, while the other two perform the ordinary duties of electric radiators. Each unit is provided with a separate switch giving independent control. When it is desired to comply with I.E.E. rules or fire insurance conditions that the element shall be connected directly to the service terminals, one of the switches can be bridged by a piece of wire. A feature of these pedestal heaters is the easily replaceable element. This consists of a firechy base round which the heating coil is wound. The coil is anchored to the base, heat

FIG. 4.—"MAGNET" HEATING ELEMENT.

insulated and connected to plug-pin contacts as shown in fig. 4. Each element has a consumption of 600 watts, and the coils are wound for voltages ranging from 100 to 250.

BUSINESS NOTES.

Bankruptcy Proceedings.—J. Skinner (Foster, Skinner and Co.), electrical fittings dealer, 40, Mulgrave Street, and 6, South Castle Street, Liverpool.—Adjudication order made October 16th.

The public examination was held on October 26th, before Mr. Registrar Mellor, at the London Bankruptcy Court, of Bernard Pordes, lately carrying on business as the United Electrical Manufacturers Co., at 18-22, Christopher Street, E.C. The debtor was brought to the Court last April on a creditor's petition, and had filed accounts showing total liabilities £7,230 5s. 10d. (unsecured £6,325 9s. 7d.), and assets £160 absorbed in the preferential claims. Replying to Mr. Warren, Official Receiver, the debtor said he was an Austrian Pole, and came to this country in 1897 from Paris; he brought with him about £1,000 in cash and goods, and commenced the business of a bicycle accessories factor in Melton Street, E.C., removing in 1906 to South Street, Finsbury, where he traded in mechanical and other novelties. In May, 1912, witness entered into partnership with another person, and they commenced as manufacturers of electrical novelties, under the style of the United Electrical Manufacturers Co.; the business was successful, but on the outbreak of the European war, the partnership was automatically dissolved, his partner being a German. Witness took over the business and paid to the Public Trustee a sum of about £1,800 on account of his partner's interest. The payment of that money crippled him, but notwithstanding this, as the business was increasing, he removed from Moor Lane to larger premises at 18-22, Christopher Street, and continued to trade, obtaining advances from his bankers, to whom £495 was now due. In 1915 an action to recover damages for wrongful dismissal was successfully brought against him by one of his employés, and resulted in a loss to him of nearly £2,000; this further increased his difficulties, but with the hope of ultimately recovering his position, he continued to "carry on." A considerable portion of the business consisted in the manufacture of electrical pocket-lamp batteries, and in 1918, a large stock of them, numbering 120,000 and amounting in value to between £10,000 and £12,000, was returned to him by his customers as being defective, owing to the inferior quality of the chemicals supplied by certain of his creditors and used by him in the manufacture of the batteries. His loss on those goods was at least £8,000. In July, 1919, with the object of raising further capital, witness formed a limited liability company, under the style of "The Unelma Co., Ltd.," with a nominal capital of £9,000, which acquired his business as a going concern for £3,000 in shares; he was appointed managing director at a salary of £20 a week, but on the day on which the receiving order was made against him, possession of the company's assets was taken by a receiver appointed at the suit of debenture holders. Witness attributed his failure to the before-mentioned losses. Mr. Tindale Davis, on behalf of Mr. E. H. Hawkins, the trustee, also questioned the debtor, who was allowed to pass.

On Monday last a meeting was held at the London Bankruptcy Court of creditors of S. Davis, 128, Victoria Park Road, E., electrical engineer, against whom a receiving order was made on October 12th, 1920, on the petition of a creditor. The statement of affairs showed gross liabilities amounting to £206 15s., of which £190 5s. was expected to rank. No assets were disclosed. Debtor joined the R.A.F. in August, 1914, and was demobilised in January, 1919, with a gratuity of £42, with which sum he commenced business on his own account as an electrical engineer. The business was quite successful until April, 1919, when he met with an accident, and had to close the business for about 15 weeks, during which time he estimated his loss at £70. He re-opened the business in July, 1919, with liabilities amounting to £30. In January, 1920, his creditors commenced to press him, and in June, 1920, he ceased to carry on business; since then no further debts had been incurred beyond those returned in his statement of affairs. He attributed his present position to the accident referred to above and under-estimating on contracts. The estimates were given by him thinking that he would be able to execute the work himself, but owing to slow recovery after his accident he had to employ men, and lost on the contracts. The estate, being a summary one, was left in the hands of the Official Receiver.

Dissolution of Partnership.—Walker & Taylor, automobile, electrical, and mechanical engineers, Dock Street, Middlesbrough.—Mr. A. H. Walker and Mr. J. F. Taylor have dissolved partnership. Mr. J. F. Taylor will attend to debts and continue the business.

Catalogues and Lists.—The Hamworthy Engineering Co., Ltd., 76, Victoria Street, S.W. 1.—Catalogue Section A (20 pp.), an illustrated and priced list of oil engines, portable, semi-portable and stationary. The list includes small lighting sets with outputs ranging from 1 to 7 kw.

Turner Bros. Asbestos Co., Ltd., 120, Fenchurch Street, E.C. 3.—A leaflet illustrating and describing compressed asbestos grommets for packing tube ends of surface condensers, &c.

The General Electric Co., Ltd., 67, Queen Victoria Street, E.C., 4.—Booklet No. H 2,376. An illustrated and priced catalogue of "Magnet" electric fires of many types, hot-water radiators and electrically-heated towel rails. Also Leaflet H 2,375 dealing with "Magnet" multi-way pedestal heaters. Priced and illustrated.

Messrs. C. J. Ferguson & Sons, 54, Chiswell Street, E.C. 1.—Stock sheets of D.C. dynamos and motors and A.C. motors and motor-generators.

X-Rays, Ltd., 11, Torrington Place, Gower Street, W.C. 1.—A circular-letter enclosing a list of "Wellington" X-ray plates and Eastman's card cassettes and films. Sectional Catalogue No. 3 (122 pp.). A revised price list of electro-medical appliances of all types. Fully illustrated.

Messrs. Falk, Stadelmann & Co., Ltd., 83, 85 & 87, Farringdon Road, E.C. 1.—Catalogue No. 452, "Electric Bells and Accessories," including batteries, indicators, speaking tubes, burglar alarms, bell-pushes, and contacts, &c. Fully priced and copiously illustrated.

Messrs. Higgs Bros., Sand Pits, Birmingham.—"Monthly Magazine," Vol. 2, No. 8, November 1st. Stock list of D.C. motors and dynamos and A.C. motors, also notes on fuses and the usual humorous features.

Sturtevant Engineering Co., Ltd., 147, Queen Victoria Street, E.C. 4.—Leaflet No. 1,212, describing comparative tests of the Sturtevant turbine cleaner and other vacuum cleaners. Illustrated.

Messrs. S. Lesser & Sons, Ltd., 23-27, Houndsditch, E. 1.—A catalogue (six pages), illustrating a number of electrically-fitted and other artistic statuettes manufactured by the Parisian firm of Jos. Richermoz, for which Messrs. Lesser are sole agents in the United Kingdom.

Marconi's Wireless Telegraph Co., Ltd., Marconi House, Strand, W.C. 2.—Illustrated pamphlets Nos. L 157 and 158 describing Types Y.B. and Y.C. battery-charging plant.

Electrical Utilities, Ltd., 1-3, Shelgate Road, S.W. 11.—Leaflet X illustrating and describing the "Sentinel" excess current indicator (described in Electrical Review, July 30th, 1920, p. 159.) Priced.

The Ever-Ready Co. (Great Britain), Ltd., Hercules Place, Holloway, N. 7.—A general catalogue (24 pp.) of electrical specialities of many kinds, including hand lamps, batteries, bicycle lamps, medical coils, &c.

"Lamlok" Rings for Car Lamps.—Messrs. "Lamlok," Ltd., of 36, Rustall Avenue, Chiswick, W. 4, inform us that they are placing upon the market the well-known "Lamlok" ring in a suitable size to fit miniature lamps and holders as used in motor-car headlights, decorative signs, &c.

Trade Announcements.—Messrs. Automatic and Electric Furnaces, Ltd., announce that Messrs. Gross, Son and Robertshaw have been appointed sole selling agents for Wild-Barfield electric furnaces in the counties of Northumberland, Durham, Cumberland, and Yorkshire. In addition to the Newcastle office this firm has opened a branch office at 41, Great George Street, Leeds, where a demonstration furnace is in course of erection. Messrs. Macbeth Bros. & Co., Ltd., of Bombay and Calcutta, have taken over sole selling rights for India.

Mr. E. Abbott has opened a department for electrical engineering at his works at the Station Garage, Bourne, Lincs.

Messrs. Mason & Brown have removed to Volta Works, 36, Upper Charles Street, Leicester. Telephone, 4413; telegrams, Mason, Brown, Leicester.

The Westminster Tool and Electric Co., of Westool Works, Putney Bridge Road, London, S.W. 15, has appointed Mr. T. Malcolm R. Pinkney, of Sunderland, as its representative on the North-East Coast, for the sale of the "Westool" portable electric tools. Telephone, No. 1614 Sunderland.

Receivership.—Lester & Browne (London), Ltd.—Mr. B. B. McCullum, F.C.A., of 5, Chancery Lane, W.C., was appointed receiver on October 14th, under powers contained in an instrument dated September 20th, 1920.

Canal Improvements.—As a result of a number of meetings convened by the Main Transport Committee of the Federation of British Industries, a strong representation of the opinions of traders is being made before the Canals Committee, which has now resumed its sittings. Provided it is made perfectly clear that the actual carriage of goods is left entirely to private enterprise, the opinion is held that the waterways comprised in what is known as the "Cross" should, with the addition of the main waterways running east and west and connecting the Humber with the Mersey, be acquired by a new authority specially constituted for the purpose. The necessary capital for improvement schemes could not be raised by a private company; it should be provided by the State with contributions from local authorities in the areas which would be benefited. Any improvement to the canal systems should aim at bringing them up to the 100-ton standard.—*The Times Trade Supplement.*

The Export Credit Scheme.—On Monday, in the House of Commons, the Board of Trade announced that, in accordance with the suggestion of the Federation of British Industries (quoted in our last issue), advances under the export credit scheme would be increased from 80 to 100 per cent., subject to recourse against the exporter in respect of 20 per cent., as before. Applications for advances will be considered on their merits, and will not necessarily be granted.

Double-filament Lamps.—Referring to a notice of a lamp with two filaments in our last issue, Messrs. Electrical and Engineering Development, Ltd., inform us that they are the owners of a British patent application for a similar lamp, which they hope to be able to dispose of in due course.

South African Trade.—Commenting upon the decision of the Bulawayo Corporation to install an electric lighting scheme, the *British and South African Export Gazette* thinks that it marks the beginning of great developments in electrical business, and it also states that there is considerable lee-way to be made up by importers who last year only succeeded in obtaining some £30,300 worth of electrical goods, as compared with the £81,900 odd imported in 1913; taken all round, the merchant is in the unhappy position of being forced to view proposed developments with considerable doubt and uncertainty as to the possibility of satisfying the full amount of business which should attach to them. This state of affairs, however, is only temporary, and the increased output by British factories this year has already been reflected in Rhodesia, where during the first five months over £21,700 worth of electrical goods were received. Slight as this improvement may be when contrasted with the actual demand, it is nevertheless an earnest of the better supply conditions which may be anticipated. In any case, the renewal of practical interest on the part of municipalities in the schemes for public services which have for so long been in abeyance foreshadows not only important contracts for heavy plant, but a widening of the demand for store and house fittings, wire, &c.; and equally promising in another direction is the industrial activity now increasingly apparent, and also involving an extended use of electricity for various purposes. The Salisbury and Bulawayo authorities have given a good lead which will be followed by places of less importance, and a very substantial advance in Rhodesia's electrical supply trade may, therefore, be reasonably anticipated.

Theft of Lamps.—The alleged theft of a mail bag containing 850 electric bulbs, value £67, while in transit on the London and North-Western Railway between Denton and Manchester, formed the subject of an inquiry by the Manchester City Stipendiary, last week, when Joseph Taylor (30), lodging in St. John Street, Salford, who pleaded not guilty to the charge, was committed for trial at the Sessions.

Wind Power in Sweden.—A company is being formed in Sweden, with a minimum capital of 500,000 kr., and a maximum of 1,500,000 kr., to work patents by Messrs. A. Boalt & H. Sandberg for the utilisation of wind power. The object is to raise low-lying water by means of wind motors and pumps to a high-lying reservoir, from which the water would be conveyed to turbines coupled with dynamos. It is proposed to erect an experimental installation in the first place. This is not a new idea. The consideration which is always fatal to such schemes is the excessive capital cost of the plant.

Swedish Power Company.—The board of directors of Sydsvenska Kraftaktiebolaget (South Swedish Power Co., Ltd.) has decided to increase the share capital of the company to a minimum of kr. 10,000,000, with a maximum of kr. 30,000,000.—*Reuter's Trade Service* (Stockholm).

Catalogues in Spanish.—In the course of a note on British trade with Ecuador, the *Board of Trade Journal* says:—"Many of the important British firms still continue to disregard the necessity of publishing their catalogues and price lists in the Spanish language. This cannot be made too emphatic, especially when it is considered that after English, and, perhaps, Russian, no modern European language is spoken by so many millions in the world as Spanish. The cost of having these catalogues and price lists properly translated into the Spanish language and widely distributed would be negligible compared with the very probable results."

Electrical Power Engineers' Association.—We are informed that on and after November 10th the address of the association will be 102, St. George's Square, London, S.W. 1. Telephone, Victoria 9424.

Lead Report.—Messrs. James Forster & Co.'s report, dated October 23rd, states that the market was active throughout the week, prices steadily advancing and closing at the top. Monday's market opened with an immediate rise of 12s. 6d. per ton for October, and 7s. 6d. per ton for January, closing buyers for October at £35 5s., and sellers at £35 10s. Further advances followed, and on Friday closing prices for forward positions were £36 November, £35 15s. December and January, and £35 12s. 6d. The total turnover for the week was 5,000 tons. There has been considerable buying by consumers of prompt lead, and for October shipment, both in London and the country.

Messrs. G. Cawson & Co. say that there seems to be a general feeling that if the strike difficulties are settled there may be a strong demand for lead, and as supplies are now much reduced and held in firm hands, consumers may find some difficulty in covering their requirements. The outlook points to a continued firm market, with very moderate supplies for the next few months.

Wire Lamps in Switzerland.—It is stated that the Swiss Auer Co., of Zurich, which is the sole maker of Osram wire lamps in Switzerland, has made arrangements with the German combination of lamp makers (A.E.G., Siemens-Schuckert & Osram) for the extension of the production at Veltheim, near Winterthur, by the manufacture also of Wotan and A.E.G. lamps in the future. The imports of these lamps from Germany will be limited to special types, to make which would not be remunerative in Switzerland for the present, and the entire sales business has been entrusted to the Osram Co., of Zurich, which was recently constituted.

The Shipbuilding, Engineering, and Electrical Exhibition.—Notwithstanding the present industrial unrest, the latest enterprise of the Glasgow Corporation in the way of exhibitions—that of the Shipbuilding, Engineering, and Electrical Industries—will open in the Kelvin Hall of Industries, on November 8th. It is the first exhibition of its kind held in Scotland, and it will be the biggest that has taken place. Every inch of available space in the huge Kelvin Hall has been let, the exhibits comprising all types of material coming within the scope of the exhibition. The various stalls have been erected, and workmen are at present busily engaged getting the exhibits, some of which are of rather heavy material, into position. The exhibition will run for a month.

A Five-Day Week.—The directors of the Slough Trading Co., Ltd., have reduced the weekly working hours for their employés at Slough from 44 hours in six days to 40 hours in five days, without reducing their weekly earnings, thus dispensing with the four hours at present being worked on Saturdays. It is the directors' belief that employés will respond to their appeal for an output in the 40-hour week equivalent to that in the past 44-hour week.—*Daily Telegraph.*

Book Notices.—"The Centenary Volume of Charles Griffin & Co., Ltd., Publishers 1820-1920." Pp. 290 and 9 plates. London: Charles Griffin & Co. This volume is a fitting memorial of a century's labours. It is a handsomely-bound work typifying the excellence of the art of modern publishing. Lord Moulton contributes a foreword, in which he points out the importance of giving publicity to scientific and technical knowledge through the medium of books. Mr. L. P. Sydney, reader to the firm for many years, provides an historical sketch of the firm during its long life, and notes on the *personnel* past and present. Other writers include Sir W. S. Abell, K.B.E., Prof. T. Hudson Beare, and many other eminent men. Tributes are paid to the chairman and managing director, Mr. Francis J. Blight, F.R.S.E.

Scientific Papers of the U.S. Bureau of Standards, No. 388, "Adjustment of Parabolic and Linear Curves to Observations taken at Equal Intervals of the Independent Variable" (13 pp.); price 5 cents. No. 390, "Two Common Failures of the Clark Standard Cell" (8 pp. and 4 plates); price 5 cents. And No. 393, "Measurements on the Thermal Dilatation of Glass at High Temperatures" (39 pp.); price 10 cents. Washington: Government Printing Office.

"Welfare," the *Journal* of the Welfare Workers' Institute. Vol. I. No. 10 (14 pp.). The October number of this journal contains articles on "Industrial Relationship in Japan," by Kimio Hayashi, "Welfare Work in Lancashire Cotton Mills," &c.

A booklet entitled "Our New Home" has been issued by Messrs. Sir Isaac Pitman & Sons, Ltd., describing the firm's premises at 39-41, Parker Street, London, W.C.2. The House was started in 1846, off Paternoster Row, transferred to Amen Corner in 1887 (when the business was extended to publications other than shorthand books), and having purchased the business of Messrs. Ibister and Co. in 1904, more recently that of the well-known firm of Messrs. Whittaker & Co., and that of Messrs. James Selwyn & Co., Ltd., has found it imperatively necessary to take much larger premises close to Kingsway. The management has broad views and an enterprising spirit, and, as will have been seen from announcements in this column, has already taken a prominent position as a publisher of scientific and technical works.

University of London.—"University College Calendar, Session 1920-21." Pp. clxxiv + 381. London: Taylor & Francis.

The German Electrical Industry.—Addressing a meeting of the Voigt & Haeffner Co., at Frankfort-on-Main, in connection with a resolution to make an issue of 10,000,000 marks in 6 per cent. preference shares, Herr Haeffner is reported to have stated that some stagnation existed in the electrical industry in general, but the company was not much affected by it. Orders continued to arrive satisfactorily, and prices had only slightly receded, as a moderate policy in price matters had been followed.

Zanzibar Harbour Improvement.—According to *Commerce Reports*, work has been commenced upon the extensive improvements to Zanzibar Harbour, which is considered the finest natural harbour on the East Coast of Africa. The work, which it was originally estimated would cost £250,000, includes the reclamation of about 20 acres on the Malindi Spit, near the town. A concrete wharf, 1,300 ft. in length, and with a minimum depth of 30 ft. at low tide, is to be constructed. It is intended to install up-to-date equipment of all kinds, including electric cranes. Another project being spoken of is the construction of a narrow-gauge electric railway to run the whole length of the island, with branch lines at important centres.

Copper and Lead Prices.—Messrs. F. Smith & Co. report, October 26th:—Electrolytic copper bars, £104, £10 decrease; ditto sheets, no change; ditto, wire rods, £120, £10 decrease; ditto H.C. wire, 1s. 3½d., ½d. decrease; silicium bronze wire, 1s. 11½d., ½d. decrease.

Messrs. James & Shakespeare report, October 27th:—Copper bars (best selected), sheets and rods, £154, decrease £3; English pig lead, £37 10s., 10s. increase on week's quotation.

Railway Electrification in Java.—The F.B.I. *Bulletin* says:—"We understand that the Technical Adviser of the Java State Railways is at present in Europe. This gentleman is particularly interested in the question of the electrification of railways. His address may be obtained by members interested on application to the East Indies Section, Overseas Organisation."

The Coal Strike and Electricity Supply Undertakings.—

BRADFORD.—Public street lighting was reduced by 50 per cent., although coal stocks were fairly good. The Wilson-Wolf Engineering Co., Ltd., closed down on October 20th owing to depletion of coal stocks, and Messrs. Cole, Marchent and Morley had to cease working on the 23rd. Other engineering concerns were compelled to work short time.

DONCASTER.—The Corporation reduced considerably the supplies to consumers. Street lighting was curtailed, and it was announced that if the dispute was not settled by October 26th the tramway services would be stopped. A provisional week's notice was given to all employés.

HALIFAX.—The Corporation Emergency Committee decided to suspend all Sunday tramway services for the period of the strike.

KEIGHLEY.—The electricity department had very good coal stocks, and no definite restrictions were made. The supply was stated to be sufficient for five weeks.

MEXBOROUGH.—The local electricity undertaking had at the commencement of the strike a fortnight's supply of coal.

MANCHESTER.—The engineering industry in Manchester was variously affected. Many firms had sufficient coal on hand to carry on for several weeks, while the stocks of others were depleted. The Manchester and District Engineering Trades Employers' Association put forward its utmost efforts to prevent any unnecessary closing down of works. The Corporation Electricity Committee found it necessary to call attention to the poor response made to its appeal for a reduction in consumption of electricity. It was stated that the smaller consumers were the chief offenders. The large consumers generally carried out the practice of stopping their works at different periods to regulate the consumption. One of the city power stations was closed down to effect economy, and this necessitated reducing the bulk supplies to Salford, Stockport, and Middleton.

IRELAND.—Coal stocks at the commencement of the strike were small, and additional difficulty was experienced in getting regular allocations imported. Public services were maintained although ordinary supplies were reduced.

BIRMINGHAM.—Steps to economise in the use of electric current were immediately taken. An Emergency Committee was formed with Ald. Sir David Brooks as chairman, and a public statement was issued towards the end of last week stating that in view of its low stock of coal, the Corporation was unable to maintain the gas and electricity supplies at a point above 50 per cent. of the normal load. Manufacturers and others were requested so to arrange their working hours that no gas or electricity was required after 4 p.m. The suggestion was that works should be closed entirely on Saturdays, and that a five hours day should be worked on the remaining five days of the week. The Emergency Committee pointed out that following the declaration of the coal strike the consumption of electricity increased instead of decreased.

On Saturday, October 23rd, the General Electric Co. announced that a slight curtailment of certain services had been made, and that if the coal strike continued for more than another week considerable curtailments would be inevitable.

LEEDS.—In addition to the compulsory restrictions by Order of the Board of Trade, the Leeds Electricity Committee, on Friday, issued an order to the public to discontinue the use of electricity for power purposes on Saturdays, Sundays, and Mondays until further notice, except by special written permit of the manager of the electricity department. To enforce this order, it was decided that any person or firm found contravening this or the terms of the Board of Trade order should be liable to have the supply entirely cut off.

MINE ELECTRICIANS.—The Executive of the Electrical Trades Union has passed the following resolution: "That in all cases where our members are requested by the Miners' Federations or Associations to cease work, authority be given for such members to cease work, otherwise, as our members are principally engaged on maintenance, such as pumping and generally keeping the pit in order, they shall remain at work, as we understand resolutions have already been passed by the miners themselves that the pits shall be kept in order for the resumption of work when the dispute is settled."—*Star*.

UNEMPLOYMENT PAY.—The Ministry of Labour, says the *Daily Mail*, stated that if the coal strike continued for any length of time it would be impossible for the employment exchanges to cope unaided with the great number of claims to donation and benefit that would arise. Emergency arrangements were framed to enable payment to be made by all employers of any considerable number of workpeople.

EMERGENCY POWERS.—On Friday last the Home Secretary introduced an "Emergency Powers Bill" in the House of Commons, "to make exceptional provisions for the protection of the community in cases of emergency." The Bill is to come into operation whenever action is taken calculated to interfere with the supply and distribution of food, water, light, or other necessaries, or with the means of locomotion, and empowers the Government by Order in Council to make regulations and provisions for the purpose of maintaining the public services, &c.

Three modifications were made to the Bill in Parliament on Tuesday night, by which Parliament is to be called together within five days of the issue of the proclamation stating that a state of emergency exists; any regulations made under the proclamation shall cease to have validity unless they are confirmed by Parliament within seven days; and no proclamation is to remain in force for over one month without renewal. The Government accepted Mr. Hogge's amendment to limit the Bill to cases in which the supplies of food, water, fuel, and light are menaced, leaving out the words "and other necessities." The debate was adjourned.

During the week-end the tension was relieved; the railwaymen's Executive suspended the proposed sympathetic strike, and a national trade union conference was convened by the Parliamentary Trade Union Congress, to meet on Wednesday last. Conversations between the Government and the labour leaders were resumed, and the miners' Executive met in London on Saturday.

On Friday the Board of Trade announced that in order to conserve stocks of coal the Coal and Fuel Emergency Order, 1920, had been issued, providing that coal could only be supplied to industrial concerns on the issue of a permit by the local authority. Coke and similar fuels rank as coal. Managers of industrial concerns must declare their available stocks and average weekly consumption before permits can be issued. A Metropolitan Emergency Committee has been appointed, under the chairmanship of Sir H. B. Marshall, for advisory purposes, by the Secretary for Mines. The committee will deal with matters of distribution, and the local authorities with questions of administration.

The Ministry of Labour has issued a return showing the number of works and workpeople directly affected by the strike up to October 21st; the figures are as follows: Works closed, 50,803; staffs reduced by 102,062; workers on short time, 89,366.

On Friday last 344,342 claims for unemployment benefit were current. The first week's operation of the strike is estimated to have cost 8 millions sterling in wages, besides 5½ million tons of coal.

New Italian Companies.—There has been formed at San Remo the Tramvie Elettriche Liguri, a company to establish tramways in the province of Liguria, with a capital of 3,000,000 lire.

The Società Italiana Ustor has been constituted at Rome, with a capital of 50,000 lire, for the manufacture and sale of electric apparatus.

Messrs. Rech e Verzenassi have been registered as a company, with headquarters at Rome, for the manufacture of electrothermic products. Capital, 40,000 lire.

M. Fagliari e Ca. is the style of a company established at Rome (Via Gallinaccio 4), with a capital of 38,000 lire, to trade in electric lamps and accessories.

Under the title of the Impresa Electriche Sarde has been established at Cagliari a company with a capital of 120,000 lire.

At Florence Ferdinando Brogliatti e Ca. has been registered as a company, with a capital of 130,000 lire, with electrical and mechanical objects.

There has been formed at Genoa, under the style of Ing. G. B. Musso Oliva e Ca., a company to carry out electric and other installations. Capital, 100,000 lire.

With a capital of 400,000 lire, Tardini e Ca. has been embodied a company at Genoa, to trade in electrotechnical articles.

With a capital of 600,000 lire the Società Anonima Commerciale di Elettricita has been launched at Naples (Corso Umberto I), to trade in electric machinery and materials.

There has been established at Turin the Baltea, Società Anonima per Impianti Elettrici e di Irrigazione, with a capital of 500,000 lire, to supply electric and irrigation plants.

With the name of Ditta Celso Mantovani di Emilio Tolotti e Figli a company has been formed at Venice for the manufacture of electric and engineering articles. Capital, 60,000 lire.

Claims Against Mexican Government.—An intimation has been received by the Department of Overseas Trade from H.M. Legation in Mexico that a Presidential Decree has been promulgated by which the period, within which claims for damages caused by the revolution between November 20th, 1910, and June 30th, 1920, must be presented, has been extended to February 5th, 1921. After that date no claims whatever will be admitted.

Spanish Electrical Imports.—The French Chamber of Commerce at Barcelona publishes the following particulars of electric imports into Spain in 1919: Dynamos, electro-motors, &c., weight up to 100 kilos. Total imports, 495,059 kilos, being an increase of 172,580 kilos. The countries contributing were: United States, 231,877 kilos; France, 70,391 kilos; Switzerland, 62,053 kilos; England, 49,347 kilos; Germany, 11,512 kilos. Dynamos, &c., weighing from 101 up to 400 kilos*: United States, 133,791 kilos; Sweden, 73,914 kilos; Switzerland, 67,396 kilos; England, 61,632 kilos; France, 13,584 kilos; Germany, 110 kilos. Switchboards and interrupters weighing up to 400 kilos. Total imports, 242,309 kilos, being an increase of 152,941 kilos. Contributing countries: United States, 199,577 kilos; Switzerland, 23,673 kilos; England, 7,888 kilos; Sweden, 4,206 kilos; France, 3,836 kilos; Germany, 551 kilos.

* Total imports, 382,589 kilos; increase, 208,655 kilos.

Foreign Samples Exhibition.—*The Board of Trade Journal* announces that the Foreign Samples Exhibition is removing from its premises in Guildhall Courtyard to more commodious premises at No. 7 to 11, Old Bailey, E.C. 4. The new exhibition rooms will cover the whole of the first floor of the building, and will provide over 13,000 ft. of floor space for the display of the goods.

British Chamber of Commerce for Switzerland.—The British Chamber of Commerce for Switzerland has begun work and has taken convenient premises at 20, Bittergasse, Basle. The permanent Secretary-General is Mr. Alexander Richardson, the branch office at Place St. François, Lausanne, being in charge of Mr. Maurice Galland. The need of a British Chamber of Commerce for Switzerland is recognised by both British and Swiss business houses, the opinion being general that now is the right time to consolidate Anglo-Swiss commercial relations by every possible means. Most other nations doing business with Switzerland have their Chambers of Commerce there, and it certainly is time for Great Britain and her Colonies, who buy more from Switzerland than any other nation, to have corporate representation on the spot.

British Magnetos.—Although the use of foreign magnetos was allowed in the recent Air Ministry Competitions for Aeroplanes and Seaplanes (Amphibious), the whole of the eight prizes awarded were won by machines fitted with British magnetos.

LIGHTING AND POWER NOTES.

Aldershot.—Loan Sanctioned.—The Urban District Council has received sanction for a loan of £19,800 for electricity purposes, including £14,000 for plant. A proposal by the gas company to give a bulk supply of electricity has been declined in favour of extensions to the present plant.

Birkenhead.—Loan.—The Corporation is seeking sanction to a loan of £44,000 for extensions of mains and plant.

Burnley.—Extensions.—The Electricity Committee has decided to make application to the Ministry of Health for permission to borrow £5,000 for services from mains to houses. It was reported that the Government had sanctioned a further loan of £12,445 for extensions, this being the balance of the money which will probably be required. The Committee is taking steps to consider how the much-required extensions can be carried out, and a special Committee, composed of representatives of the Gas, Cleansing and Electricity Committees, has been appointed to decide as to the provision of additional land for the department.

Bolton.—Loan Sanctioned.—The Electricity Commissioners have sanctioned the borrowing by the Corporation of £656,000 in connection with the electricity undertaking.

Application is to be made by the Corporation to the Electricity Commissioners for sanction to borrow £100,000 for three years' prospective expenditure on mains and for sub-stations on consumers' premises.

Bootle.—Overloaded Plant.—The demands for electricity from the electricity undertaking are increasing so rapidly that the maximum load has already exceeded the heaviest previous winter load. The Electricity Committee has informed the Liverpool Corporation that difficulty is likely to be experienced unless an adequate supply of electricity from the Liverpool undertaking is available.

Bradford-on-Avon.—Extension of Time.—The Minister of Transport has extended, until July, 1921, the period for making the transfer authorised under the Bradford-on-Avon Electric Lighting Order, 1914.

Continental.—France.—A proposal has been made by the communes of Pacaudière and Ambierle in the department of the Loire to establish a system of inter-communal electricity supply. It has been suggested that a hydro-electric plant be established, worked by a waterfall of 240 metres. The water would be obtained from a stream which flows through the district of Arfeuilles, and would give the necessary flow even in periods of drought. An engineer has been appointed to investigate the scheme.—*Reuter's Trade Service* (Paris).

The Compagnie Parisienne de Distribution d'Electricité has received the sanction of the Conseil Municipal of Paris for an outlay of 14,638,900 fr. during the years 1920 and 1921, being a portion of the total of 190,000,000 fr. for new works for which the Conseil's approval will be sought.

The installation of a 120,000-volt transmission line has been begun by the Compagnie Lorraine d'Electricité, linking that company's central station at Vincey with Valenciennes, in the section Laneuveville to Landres. This latter section is part of the State super-network which is to be set up in the "Freed Lands" for which the law of April 5th, 1920, allotted a credit of 135,000,000 fr. The equipment of the Vincey-Valenciennes line comprises six aluminium cables 180 sq. mm. in section, supported on metal standards 25 metres high. Suspension insulators have been fixed to withstand a pressure of 120,000 volts.

The Omnium Régional d'Electricité is about to set up a new hydro-electric generating station on the Bave river, in the department of Haute Loire. The estimated power to be obtained is 900 H.P., allowing of the supply of lighting and power to several localities in the Haute Loire and Puy de Dôme Departments.

Spain.—In the Spanish Government's Budget for the current year provision is made for a sum of 2,500,000 pesetas for the electrification of the plant at the State sulphite of lead mines known as Arrayanes, at Linares (Province of Jaen). The necessary energy will be supplied from the power station which is being established by the Mengemor Co. to utilise the water power of the Carpio Falls.

Coventry.—Loan.—The Town Council is recommended by the Electricity Committee to apply for a loan of £15,000 for the purchase of transformers.

Electricity District.—West Riding (Aire and Calder).—The Electricity Commissioners, having considered representations that have been made with respect to the above area (see p. 815 of our June 25th issue), give notice that they have extended the time within which objections or representations may be made, or any scheme may be submitted, until December 31st, 1920.

Fleetwood.—Loan Sanctioned.—The Electricity Commissioners have sanctioned the borrowing by the Urban District Council of £5,000 for mains and services and £2,000 for meters.

Fort William.—Hydro-electric Scheme.—The British Aluminium Co.'s Lochaber scheme of hydro-electric power will cost £3,500,000. It impounds the waters of Lochs Treig and Laggan, and includes a tunnel through rock a distance of 15 miles to Fort William, where the generating station will be erected. It is expected that Government sanction will be obtained.

Galashiels.—Cable Extension.—The Electricity Supply Co. intends to lay a cable from Galashiels to Selkirk.

Greenock.—New Station.—It is reported that a big electricity station is to be erected in connection with the Government scheme. The town is a great shipbuilding centre, and has also important sugar refineries. The new generating station, it is stated, will have a capacity 10 times greater than the existing Corporation works, and may cost £2,000,000. A scheme for the electrification of the railways is also mooted.

Hastings.—Year's Working.—The accounts of the Electricity Department record a total revenue for the year ended March 31st last, of £32,061, as against £20,915 for the previous period. Working expenses amounted to £21,444, as against £17,232, leaving a gross profit of £10,620 (£3,683). After payment of all capital charges, the result was a net profit of £3,552. The previous year's working showed a deficit of £6,801.

Kirkcaldy.—Sale of Station.—A communication has been received by the town clerk from the Fife Power Co., stating that it is prepared to purchase the burgh's electrical undertaking, and take possession on May 15th next. The price offered by the company in respect of the undertaking has not been disclosed.

Liverpool.—Loan.—The Electric Power and Lighting Committee has recommended that an application be made to the Electricity Commissioners for sanction to the borrowing of £25,290 in respect of the provision of electric mains and services to the houses now being built in various parts of the city.

London.—Fulham.—Among the suggestions received by the Borough Councils aiming at providing employment for ex-Service men, was one that the existing gas lamps should be replaced by electric lamps. The Council, however, considers that the number of men which could be employed on this work would not be commensurate with the expenditure involved—viz., about £42,100.

Hammersmith.—Owing to the prohibitive cost of supplying gas-stoves to the houses nearing completion at the Wormholt Estate, the Housing, &c., Committee has asked the Electricity Committee to furnish an estimate of the cost of installing electric cookers in 40 or 50 of these houses. The Council has arranged to give a supply to the Shepherd's Bush Exhibition, Ltd., for distribution to its tenants, as this is considered a better arrangement than the Council supplying tenants direct. The rates to be charged are 4·45d. per unit for general lighting, 5·45d. for stand lighting, and 2·73d. for power.

St. Marylebone.—The Electric Supply Committee recommends application for sanction to borrow £8,500 for the purchase of high-pressure equipment and service cables in connection with a supply, under a 10 years' agreement, to Messrs. Selfridge & Co.'s main premises.

Sanction to a loan of £200,450 for plant extension has been received from the Electricity Commissioners, with an intimation that the borrowing of further sums will be considered when the actual cost of the various works is ascertained.

Maidstone.—Year's Working.—The total income of the Electricity Department for the year ended March 31st last was £43,935, as compared with £31,341 for the previous period. Working costs amounted to £32,263, as against £23,801, leaving a gross profit of £11,672 (£7,540). The net result after payment of capital charges was a profit of £1,486, comparing favourably with a deficit of £177 in 1918-19.

Manchester.—Curtailment of Supplies.—The decision of the Electricity Department to cut down all electricity supplies by 25 per cent. was superseded by a Board of Trade Order stipulating that only 50 per cent. of the average supply for the preceding four weeks was to be given. This order applies not only to municipal undertakings, but to firms owning private plants.

Navan (Co. Meath).—Electric Lighting Scheme.—The efforts of the Urban Council to raise a loan of £10,000 for the provision of an electric lighting scheme have been unsuccessful. The Local Government Board for Ireland intimates that no further grant will be made to the Council until it complies with legal requirements. The Council does not "recognise" the British Government.

Merton.—Proposed Extension. — The note which appeared under the above heading in our issue of October 15th, was due to a misapprehension. The information contained therein referred to the Wimbledon undertaking which supplies Merton.

New Brunswick.—Water Power Development.—The Government of New Brunswick has decided to embark upon a progressive policy with respect to the development of the water powers of the province. The Premier has announced that the initial effort will be made upon the Musquash and Shogemoc Rivers.

In the case of the first-named river the waters of the west branch are to be diverted into the east branch in order that both may be utilised at one power house. Tenders are to be called for immediately for the development of power at both the Musquash and Shogemoc sites. In the meantime plans and estimates are being prepared by the New Brunswick Electric Water Powers Commission, a Government-controlled body. Later, attention will also be given to the development of water power at other points in the province, the most important of which is the proposed construction of a large power plant at Grand Falls on the St. John River.

The total hydro-electric power installed in New Brunswick up to January, 1920, according to statistics compiled by the Dominion Water Powers Branch, was 18,080 h.p., while undeveloped water powers of the province were estimated at 300,000 h.p.

The two chief water power sites in New Brunswick are at Grand Falls, on the St. John River, and at the falls on the Nepisguit River, in the northern part of the province, about 20 miles from Bathurst. The former is the largest potential water power site in the Maritime Provinces, and one of the largest in the Dominion. Such rivers as the Musquash, Miramichi, Tobique, and Aroostook are also known to have a number of large power sites.

One thing that has somewhat retarded the development of hydro-electric energy at some of the best sites in New Brunswick is the absence in the vicinity of a sufficient number of industrial customers to warrant development. This is particularly true of the Grand Falls site on the St. John River, which is about 200 miles distant from the City of St. John. Some time ago a scheme was under consideration for developing 80,000 h.p., under a head of 140 ft., at this site, but it has not yet been definitely decided upon.—*The Times Trade Supplement.*

Newtown (Mont.). — Electric Lighting Scheme.—The Town Council has asked a firm of Liverpool electrical engineers to make a survey of the town and report on a scheme of electric lighting.

Rickmansworth and Chorley.—Time Extension.—The Minister of Transport has extended the time until July, 1921, of the Rickmansworth and Chorley Electric Lighting Order, 1914, for the extension of mains, &c.

Skipton.—Electricity Supply.—The District Council has approached the Keighley Corporation with reference to the supply of electricity. A distance of 10 miles is involved.

Southend-on-Sea.—Price Increase Postponed.—The Town Council has postponed for three months increased charges for electricity recently decided upon.

Whitehaven.—Electricity Order.—The Rural District Council is applying to the Electricity Commissioners under the Electricity (Supply) Acts, 1882 to 1919, for a special Order to authorise the Council to provide and distribute electrical energy for lighting, heating, traction, power and all other public and private purposes within the parishes of Distington, Parton, Moresby, Weddicar, Hensingham, Sandwith, Preston Quarter, Rottington, St. Bees, Lowside Quarter, St. Bridget and St. John Beckermet Haile and Gosforth, in the rural district of Whitehaven, in the county of Cumberland, together with all powers usually conferred upon distributors of electricity. Any objections to the granting of this order must reach the Commissioners within 30 days of the date of the official notice (October 22nd).

TRAMWAY AND RAILWAY NOTES.

Blackburn.—Wages Demand.—It is estimated that the 12s. per week advance demanded by tramwaymen will cost the Corporation, if granted, an extra £5,000 per year. The Blackburn wage bill last year was £62,000, compared with £23,000 in 1914. It is authoritatively stated that if the demand is conceded fewer than 25 per cent. of the municipal tramways will be able to avoid going on the rates this year.

Brazil.— Railway Electrification.—The Chamber has approved a Bill for a credit of 45,000 contos for the electrification of the Central Brazil Railway.—*Reuter's Trade Service* (Rio de Janeiro).

Continental.—France.—The several tramway and motor-'bus companies whose undertakings are to be purchased by the General Council of the Seine have combined to guarantee the subscription of the capital of the new company to be formed to continue the working on lease from the General Council of all these transport concerns as a united undertaking, as from the beginning of next year.

Switzerland.—According to the Berne correspondent of the Associated Press, the Swiss Government is negotiating for a new loan of about 300,000,000 fr. for the electrification of the National Railway. The exact amount of the loan and the terms have not yet been fixed.—*Reuter's Trade Service* (New York).

Russia.—A Bolshevist wireless message announces the successful trial of an electric train, which travelled from Petrograd to Moscow, a distance of 390 miles, in 15½ hours.

Essex.—Light Railway.—It is proposed to construct a light railway from Ongar through Dunmow to Haughley, in Suffolk. It would connect with the Mid-Suffolk line at Haughley, providing another route to Southwold. If support is forthcoming, a Parliamentary Bill will be promoted to take the place of the Bill which was passed before the war, but which has now lapsed.

London. — Tramcars in Collision. — On Saturday morning a collision occurred during the dense fog between two L.C.C. tramcars in the Old Kent Road, near East Street. As the cars, in both of which were several passengers, were proceeding towards the New Cross depôt the front car stopped to set down a passenger, and had just restarted when the second car crashed into it. Four persons were injured. The injured persons were taken to a shop near by, where they received first-aid treatment. Two of them, who received slight head wounds, then proceeded home. A middle-aged woman was badly hurt about the face and a young man received a scalp wound. They were removed in an ambulance to Guy's Hospital, and left after receiving attention. The cars were much damaged by the impact, but the drivers escaped injury. —*Daily Telegraph.*

Metropolitan Train Derailed.—Traffic on the Metropolitan Railway was considerably hampered through the derailing of a train between St. John' Wood and Baker Street early on Saturday morning. A breakdown gang was speedily on the scene of the accident, but many hours' labour were necessary to restore the normal conditions, and in the meantime an hourly service was run. The derailed coaches were part of a train which, fortunately was empty, being bound for New Cross to deal with the football crowds later in the day.—*Daily Telegraph.*

L. & Y. Railway.—Electrification.—Crompton District Council is urging the L. & Y. Railway Co. to proceed with its scheme for electrifying the railway line from Manchester to Shaw. In 1914, plans and specifications for the scheme were prepared by the company, but the war stopped further progress, and the local authorities affected are now pressing for the work to be proceeded with.

Midland Railway.—Cables Destroyed.—A great part of the cables supplying the Derby works of the Midland Railway Co. was destroyed by fire last week. It is stated that 9,000 employés were forced to stand idle, chiefly in the engineers' department. It was expected to have the cables re-instated by Monday, October 25th.

Sheffield.—Accident.—A tramway car, when rounding a curve on a steep gradient in the Crookes district on Tuesday, jumped the rails, broke through a wall, and fell into a house cellar. The driver stuck to his post, and neither he nor any of the passengers, who made no attempt to leave the runaway car, were injured.

Wolverhampton.—Electric Vehicles.—Mr. J. C. Dawes, representing the Ministry of Health, held an inquiry on October 20th, respecting an application by the Corporation, for sanction to borrow £4,614 for the purchase of electric vehicles for the removal of house refuse. The town clerk explained that while the Corporation found that horse vehicles were quite satisfactory for short distances, for longer distances to the outside of the borough, where housing schemes were being developed, electric vehicles would be more economical and more convenient. Unless the suggested vehicles were purchased, new horses would have to be purchased. A recent test with an electric vehicle as compared with horse-drawn vehicles, had been made, and had proved favourable in cost to the former. It was possible having regard to existing conditions, that the figure of £4,614 would be exceeded. There was a suggestion, however, that the cost might be reduced by the bodies being made in the millwrights' shop at one of the Council's depôts.

TELEGRAPH AND TELEPHONE NOTES.

Amateurs' Wireless.—On February 1st, 1921, wireless amateurs of America will attempt to establish communication with English wireless amateurs, and they believe they can bridge the Atlantic. The arrangements in this country for the co-ordination of amateurs who wish to take part in the experiment are in the hands of Mr. Philip R. Coursey, B.Sc., and all communications should be addressed to him at 12-13, Henrietta Street, W.C. 2.

Ecuador.—Wireless Telegraphy.—The *Prensa*, of Lima, announces that the Government, with a view to creating rapid means of communication across the mountainous regions of the Republic, is to set up a wireless telegraphic network, and a

contract had been given to the Société Française Radio-électrique. The number of stations to be established is 14, five of which would be of 10 KW.; five of 5 KW.; three of 1 KW.; and one of 70 KW. capacity.

Telephone Call Recorder.—It is reported that Mr. W. C. Sutherland, of Birmingham, has invented a compact instrument which records telephone calls and automatically times them, also ringing a warning bell towards the end of the regulation three minutes. The device is contained in a small box, at the front of which is a three-minutes' dial. When the user has obtained a call he presses a stud above the clock face and this sets going the clock and moves up a paper ribbon to a fresh numbered, ruled, and vacant space in which he can write the name and town of the person called. The ribbon works through and out of the instrument, and can be torn off periodically. In this way a daily, or weekly, record can be kept.

Telephone Rates.—SELECT COMMITTEE.—The Select Committee of the House of Commons, of which Sir Edward F. Coates is chairman, resumed its sittings after the autumn recess on October 21st, and evidence was given on behalf of the National Chamber of Trade as to whether the flat rate system should be retained or a message rate substituted.

United States.—INTERNATIONAL COMMUNICATIONS CONFERENCE.—Sir Auckland Geddes and the Ambassadors of France, Italy and Japan, accompanied by Messrs. Colby, Baker and Daniels, and the representatives of the International Communications Conference, left Washington on October 21st, on a tour of inspection of the wireless stations along the American coast.

CONTRACTS OPEN AND CLOSED.

(The date given in parentheses at the end of the paragraph indicates the issue of the ELECTRICAL REVIEW, *in which the "Official Notice" appeared.)*

OPEN.

Australia.—January 19th, 1921. Victorian Railways Department. Supply, delivery, and erection and testing, or, alternatively, supply and delivery of electric furnace and equipment, and/or, alternatively, for supply and delivery of equipment, and drawings for electric furnace. Particulars from the Agent-General for Victoria, London, S.W.—*Tenders.*

WESTERN AUSTRALIA.—December 28th. Postmaster-General's Department. Telegraph and telephone instruments and parts. (Schedule 689).

Belgium.—November 3rd. Municipal authorities of Hognoul (Province of Liége). Concession for the supply of electrical energy for lighting and power purposes in the town.

November 4th. Municipal authorities of Schaerbeek. Supply of 1,675 electricity meters (single-phase and three-phase). Copies of the specification may be obtained from the Service de l'Electricité, Hotel Communale, Schaerbeek.

November 9th. Municipal authorities of Antwerp. Electrical plant. Specification from the Hotel de Ville, Antwerp.

November 8th. The Directeur-General of the Société Nationale des Chemins de Fer Vicinaux, 14, Rue de la Science, Brussels. Construction of a new sub-station at Middlekerke.

December 14th. The municipal authorities of Antwerp. Supply of a set, comprising electric motor and pump, for the raising of the bridge over the Royers Dock. Specifications can be obtained, at a cost of 2 francs, from the Hotel de Ville, Antwerp.

Doncaster.—November 2nd. Electricity Department. One 750-KW. rotary converter and L.T. switchgear. (October 22nd.)

Dublin.—November 16th. G. N. Railway Co. (Ireland). 12 months' supply of general stores, including electrical fittings, lamps, cable and wire, &c. (See this issue.)

France.—November 19th and 26th. French State Railway authorities, Rue de Rome, Paris. Electrical material for the Ouest-Ceinture sub-station; two electrically-operated travelling cranes at the La Garenne electrical repair shops. Particulars may be obtained from the Service Electrique, 88, Rue de Rome, Paris.

November 1st. French State Railway authorities, 43, Rue de Rome, Paris. Supply of 15 electrically-operated capstans (three-phase alternating) for various stations on the system. Particulars can be obtained from the Service Electrique.

BOULOGNE-SUR-MER.—November 16th. Chambre de Commerce. Supply and erection of six large electric travelling cranes for the Nord Quay of the Loubet Dock, Boulogne-sur-Mer.

Ilkley.—November 1st. Installation of electric light, electric bells and telephone, at Middleton-in-Wharfedale sanatorium. West Riding Architect, County Hall, Wakefield.

Manchester.—November 8th. Electricity Committee. Supply and erection of high and low pressure steam, feed, &c., pipework—including alterations to existing pipework, &c. (October 15th.)

November 22nd. Electricity Department. Motor-generators, battery boosters and switchgear. (October 22nd.)

Montreal.—H.M. Senior Trade Commissioner in Canada and Newfoundland reports that a Montreal company desires quotations and date of earliest delivery for the following plant: Four 1200 H.P., 240 R.P.M., 6,600 volts, three-phase, 60-cycle, two-bearing coupled type synchronous motors, with rheostat and auto-transformer for starting. It is understood that if United Kingdom manufacturers can give delivery of these machines within even six months from date, there is every possibility or the order being given; also that it is not so much a matter of price, as the assurance of delivery. The name and address of the company making the above inquiry will be furnished by the Department of Overseas Trade to United Kingdom firms interested, on application.

Turton.—November 10th. Urban District Council Electricity Committee. Overhead lines and underground cables. (October 15th.)

CLOSED.

Birkenhead.—Electricity Committee:—

Service cable.—W. T. Henley's Telegraph Works Co., Ltd., £1,901.
Main cable.—Macintosh Cable Co., Ltd., £2,854.

Bolton.—Electricity Committee:—

Supply and erection of a 12,000-KW. maximum rated turbo-alternator, for Back-o'-th'-Bank generating station.—English Electric Co., Ltd.

Barnes (Surrey.)—Urban District Council:—

Water-flow meter for the electricity works.—United Water Softeners, Ltd., £107.

Bradford.—Electricity Committee:—

Buildings, boilers, feed pumps, coal-handling plant, and piping system, for No. 4 boiler house at Valley Road Works.—Babcock & Wilcox, Ltd.
Heating installations in new canteen, garage and new headquarters (mains department), Canal Road.—Rosser & Russell.
Three E.H.T. switchgear cubicles for transformer chambers, &c.—Ferguson, Pailin, Ltd.
E.H.T. feeder switchgear at Valley Road works, &c.—A. Reyrolle & Co., Ltd.
Re-inforcing steel sheets for tunnel between Nos. 3 and 4 boiler houses, Valley Road Works.—British Re-inforced Concrete Steel Co., Ltd.

Tramways Committee:—

Treatment of rails of Birkenshaw section, by the Sandberg patent sorbitic hardening process, at 27s. per yard.—Scholey & Co., Ltd.

Government Contracts.—The following Government contracts have been placed during September, 1920.

ADMIRALTY (CONTRACT AND PURCHASE DEPARTMENT).

Electric cable.—Callender's Cable & Construction Co., Ltd.; Johnson and Phillips, Ltd.
Cell accumulators.—Fuller's United Electrical Works, Ltd.
Electrodes.—Quasi-Arc Co., Ltd.
Motor generator, &c.—Metropolitan-Vickers Electrical Co., Ltd.

WAR OFFICE.

Crucibles.—Doulton & Co.; Morgan Crucible Co., Ltd.
Electric meters.—Electrical Apparatus Co., Ltd.

POST OFFICE.

Telegraph apparatus.—Automatic Telephone Manufacturing Co., Ltd.
Telephone apparatus.—Automatic Telephone Manufacturing Co., Ltd.; British L. M. Ericsson Manufacturing Co., Ltd.; General Electric Co., Ltd.; Phœnix Telephone and Electric Works Co., Ltd.; Siemens Bros. & Co., Ltd.; Western Electric Co., Ltd.
Telegraph and telephone cable.—Hackbridge Cable Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; International Electric Co., Ltd.; Johnson & Phillips, Ltd.; London Electric Wire Co. & Smiths, Ltd.; Pirelli General Cable Works, Ltd.; Siemens Bros. & Co., Ltd.; Union Cable Co., Ltd.; Western Electric Co., Ltd.
Dry cells.—Ever Ready Co. (Great Britain), Ltd.
Cords for telephones.—London Electric Wire Co. & Smiths, Ltd.; Phœnix Telephone & Electric Works, Ltd.; Siemens Bros. & Co., Ltd.
Dynamotors.—Automatic Telephone Manufacturing Co., Ltd.
Solder.—E. Austin & Sons; British Insulated & Helsby Cables, Ltd.; Quirk, Barton & Burns (St. Helens), Ltd.
Insulated tails.—London Electric Firm.
Wallboards.—British L. M. Ericsson Manufacturing Co., Ltd.; Siemens Bros. & Co., Ltd.
Bronze wire.—T. Bolton & Sons, Ltd.; F. Smith & Co., Incorporated in the London Electric Wire Co. & Smiths, Ltd.
Enamelled and silk covered copper wire.—London Electric Wire Co. and Smiths, Ltd.
Laying conduits.—Lee (Handen Road): J. Mowlem & Co., Ltd London-Dorking (section 1a): J. Mowlem & Co., Ltd. Westminster and Chelsea: J. Mowlem & Co., Ltd. Tower (temporary) exchange area: J. Mowlem & Co., Ltd. Hornsey, Islington, &c.: A. Thomson & Co. Fulham: A. Thomson & Co. London-Bristol-Newport (S.W. section IV): Westminster Public Works Co., Ltd. East Croydon: Greig and Matthews. Clerkenwell exchange area: Greig & Matthews. London-Watford (London district): Greig & Matthews. Kensington (Drayton Gardens): Foote & Milne Ltd. Hammersmith, &c.: Foote & Milne, Ltd. Putney-Richmond Junction: S. Kavanagh & Co. London-Bristol-Newport (S.W. section II): W. Dobson. Enfield (Ridgeway Road and Chase Side): G. J. Anderson. Camberwell (Albany Road): G. J. Anderson. South Lancs. P.O. Engineering District: J. F. Hodge and Co. South Midland, Eastern, S.E., and S.W. P.O. Engineering Districts: Western Electric Co., Ltd.
Telephone exchange equipment.—Pontypridd: Peel-Conner Telephone Works, Ltd. Avenue (London): Peel-Conner Telephone Works, Ltd. Giffnock: British L. M. Ericsson Manufacturing Co., Ltd. Sub-contractors for batteries: Chloride Electrical Storage Co., Ltd. For charging machines: Crompton & Co., Ltd., for gas engine, Natural Gas Engine Co., Ltd. Canterbury: British L. M. Ericsson Manufacturing Co., Ltd.; sub-contractors for batteries, Chloride Electrical Storage Co., Ltd., for charging machines, Crompton & Co., Ltd. Leamington: Siemens Bros. & Co., Ltd.; sub-contractors for batteries, Pritchett & Gold E.P.S. Co., Ltd., for charging machine, English Electric Co., Ltd. Falkirk: Siemens Bros. & Co., Ltd.; sub-contractors, for charging machine, English Electric Co., Ltd., for batteries, D.P. Battery Co., Ltd. Gerrard (London): Western Electric Co., Ltd. Bristol: Western Electric Co., Ltd. Londonderry: Western Electric Co., Ltd. Streatham: Western Eleteric Co., Ltd. Nottingham: Western Electric Co., Ltd. Langside, Glasgow: Western Electric Co., Ltd.

Copper strand wire.—British Insulated & Helsby Cables, Ltd.
Silk-covered E.L. wire.—Macintosh Cable Co., Ltd.
Enamelled and flame proof wire.—Macintosh Cable Co., Ltd.
Flame proof wire.—British Insulated & Helsby Cables, Ltd.; London Electric Wire Co. & Smiths, Ltd.; Macintosh Cable Co., Ltd.
V.I.R. wire.—W. Geipel & Co., Ltd.
Band conveyor.—Nottingham H.P.O.; A. Sauvée & Co., Ltd.
Manufacture and supply of submarine cable, England-Ireland.—Siemens Bros. & Co., Ltd.
Manufacture, drawing in, and jointing cable, Manchester-Oldham.—W. T. Glover & Co., Ltd.

INDIA OFFICE, STORES DEPARTMENT.

Baudot apparatus.—Elliott Bros. (London), Ltd.
Batteries.—Chloride Electrical Storage Co., Ltd.
Trifurcating boxes.—Callender's Cable & Construction Co., Ltd.
Switchboard cable.—British Insulated & Helsby Cables, Ltd.
Conduits.—Perfecta Seamless Tube & Conduit Co.
Feeder pillars.—Callender's Cable & Construction Co., Ltd.
Insulator cups.—Taylor, Tunnicliff & Co., Ltd.
Magnetos.—Simms Motor Units (1920), Ltd.
Motors, &c.—Bruce Peebles & Co., Ltd.; Laurence Scott & Co., Ltd.
Telegraph apparatus.—Creed & Co., Ltd.
Copper wire.—British Insulated & Helsby Cables, Ltd.; Elliotts Metal Co., Ltd.; R. Johnson & Nephew, Ltd.

CROWN AGENTS FOR THE COLONIES.

Submarine telegraph cable.—Siemens Bros. & Co., Ltd.
Covers for Diesel Engines.—English Electric Co., Ltd.
Electrical materials.—General Electric Co., Ltd.
Diesel engine, &c.—English Electric Co., Ltd.
Lightning arresters.—British L. M. Ericsson Manufacturing Co., Ltd.
Telegraph line material.—Siemens Bros. & Co., Ltd.; Bullers, Ltd.
Telephones.—British L. M. Ericsson Manufacturing Co., Ltd.
Telephone line material.—Siemens Bros. & Co., Ltd.
Electric turntable.—Craven Bros. (Manchester), Ltd.
C.I. stay wire.—Whitecross Co., Ltd.
Copper line wire.—Shropshire Iron Co., Ltd.
Steel wire.—P. & W. MacLellan & Co., Ltd.

H.M. OFFICE OF WORKS.

Engineering services.—Newcastle Ministry of Pensions Office, electric wiring: Wilson & Ridley. Old Ford Stationery Office, electric wiring: Malcolm & Allan, Ltd.

OFFICE OF PUBLIC WORKS, DUBLIN.

Belfast.—Electrical works and supplies: A. Stevenson.

Hythe (Kent).—Town Council:—

Electric-light installation for houses.—J. Pain & Co., 98s. 6d. per point.

London.—HAMMERSMITH.—Borough Council. Electricity Committee. Provision of sub-stations for the supply of electricity to new housing estate:—

Five electricity sub-stations, £2,070.—**J. McManus & Co., Ltd.** (recom.).
Cable drum carriage, £160.—**J. & J. Bescoby & Co.** (recommended).
500 yd. ·3 sq. in., £570; 500 yd. ·2 sq. in., £410; 1,000 yd. ·05 sq. in., £103; and 1,000 yd., 7/20, twin conductor, concentric cable, £192 (total £1,575).—**Western Electric Co.** (recommended).
Lagging for steam pipes for the new Stirling boiler.—**Newall's Insulation Co.** (recommended).
Steel feed delivery pipes, £175.—**J. E. & P. Spencer** (recommended).

ST. MARYLEBONE.—Borough Council. Highways Committee:—

Dust-sifting plant (stand-by supply), 50-kw. generator, coupled to Parsons paraffin engine, £875.—**Multi-Locular Shipbuilding Co.** (accepted).

Electricity Committee:—

One "Balata" fuel conveyor belt, £521.—**J. Dawson & Co., Ltd.** (recom.)

BATTERSEA.—Electricity Committee. Recommended:—

Soot-cleaning apparatus, fitted with "Diamond" Blower Co.'s gear, £337; feed regulator for No. 11 boiler, £105.—Babcock & Wilcox, Ltd.

FORTHCOMING EVENTS.

Junior Institution of Engineers.—Friday, October 29th. At 39, Victoria Street, S.W. At 8 o'clock. Social evening.

Royal Institution of Great Britain.—Monday, November 1st. At Albemarle Street, W. At 5 p.m. General meeting.

Institution of Civil Engineers.—Tuesday, November 2nd. At the Institution, Great George Street, S.W. At 5.30 p.m. Inaugural address by the President (Mr. J. A. Brodie).

Institution of Electrical Engineers (South-Midland Centre, Students' Section).—Tuesday, November 2nd. At the University, Birmingham. At 7.30 p.m. Paper on "Electrical Systems and their Apparatus used on Motor-cars," by Mr. H. B. Stanton.

North-Western Centre (Liverpool Sub-Centre).—Monday, November 1st. At the University, Liverpool. At 7 p.m. Chairman's (Mr. H. Dickinson) address. The President of the I.E.E. (Mr. Ll. B. Atkinson), will be present and will address the meeting.

(East-Midland Sub-Centre).—Tuesday, November 2nd. At the Technical College, Loughborough. At 6.45 p.m. Paper on "Electricity Supply Meters," by Mr. A. J. Cridge.

(South-Midland Centre.)—Wednesday, November 3rd. At the University, Birmingham. At 7 p.m. Inaugural address by the chairman (Mr. F. Forrest).

Society of Engineers (Inc.).—Monday, November 4th. At Burlington House, Piccadilly, W. At 5 p.m. Ordinary meeting.

Chemical Society.—Thursday, November 4th. At Burlington House, W. At 8 p.m. Ordinary scientific meeting.

Institution of Mechanical Engineers.—Friday, November 5th. At the Institution, Storey's Gate, S.W. At 6 p.m. Thomas Hawksley lecture on "Limit Gauging," by Sir R. T. Glazebrook, F.R.S.

Edinburgh Electrical Society.—Friday, November 5th. At the Philosophical Institution, Queen Street. At 8 p.m. Paper on "Some Incidental Uses of Electricity," by Mr. F. A. Pilkington.

Motor Exhibition.—November 11th to 18th. At Olympia, W., and the White City, Shepherd's Bush, W.

NOTES.

Vehicle Lights.—The Committee appointed by the Ministry of Transport which has been inquiring into the problem of dazzling vehicle headlights, believes that it has found a lamp which, while avoiding dazzle, will give ample illumination for safe driving at night. The Committee has ordered certain tests to be made, on the completion of which details of the lamp will be made public. The principal feature of the lamp is said to be an arrangement whereby it is possible to regulate the height of the illuminating shaft of light, so that it will throw a beam on the ground not extending above the level of a man's waist.

Educational.—LONDON UNIVERSITY.—At a meeting of the Senate, on October 20th, it was decided to accept the Government's offer of a site at Bloomsbury, subject to a number of conditions. The Senate assumes that the offer does not incidentally involve a policy of curtailing the work of other colleges and schools of the University, and that these institutions will not receive less favourable treatment from the Government.

Among the successful candidates in the 1920 competition for Royal Scholarships and Free Studentships (Science) of the Board of Education was Ernest T. A. Rapson, an electrical fitter in H.M. Dockyard, Plymouth, who receives a Royal Scholarship.

COMMERCIAL COURSES.—The London County Council announces particulars of courses at its Stillness Road Commercial Evening Institute, Honor Oak Park, S.E. 23. A course, consisting of five lectures on "Salesmanship," by Capt. Oliver A. Minns, concludes with a lecture on "Selling Schemes," on Monday, November 1st. A second course of five lectures by the same lecturer commences on November 8th, when the matter dealt with will be "Advertising." The fee for the course is 2s. 6d. A further course on "Income-Tax and Excess Profits Duty in Relation to Accounts" will be given early in January next.

Freemasonry.—The annual installation meeting of the Kelvin Lodge was held at Mark Masons' Hall, on the 22nd inst., in the presence of a very large number of gentlemen associated with the electrical industry. The reigning Master (Mr. T. W. Greaves) duly installed Mr. H. Porter-Cox his successor in office, after which the latter appointed and invested his officers. At the conclusion of the ceremony the members and their visitors, to the number of 100, dined in the Connaught Rooms adjoining, where a very happy evening was spent. Among those present were Mr. Edward Manville, M.P., who is a Grand Junior Deacon of England; Mr. E. J. Reid, Assistant Grand Superintendent of Works, and Mr. P. P. Kipping, Past Assistant Grand Superintendent of Works, together with various gentlemen holding other positions of rank in the Masonic world. During the evening, reference was made by the newly-installed master to the magnificent way in which the Kelvin Lodge had supported the Masonic charities in the few years since its consecration in 1914, and he expressed a hope that it would long continue to hold such a creditable position among the London Lodges. The toast of the visitors, which was proposed by Mr. H. W. S. Rentell, was responded to by Mr. W. M. Aitken, the reigning Master of the Telephone Lodge, and other guests. An excellent programme of music brought to an end a most enjoyable evening.

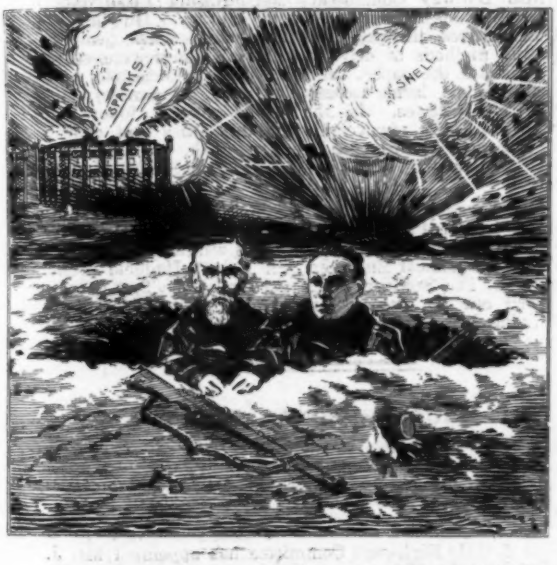
Appointments Vacant.—Plumber-jointer, for the Redditch Urban District Council Electricity Works; telegraph engineers (£480), for the Governments of the Gold Coast and Nigeria; telephone inspectors (£300 + temporary allowance of 50 per cent.), for the Posts and Telegraphs Department, Tanganyika Territory; assistant electrical engineer or power station foreman ($150 per month, dollar = 2s. 4d.), for the Singapore Harbour Board. See our advertisement pages to-day.

Work and Wages.—The Socialist Party at Bradford has issued a general "Municipal Programme" for all its local election candidates. The programme includes free stoves and meters (both gas and electricity); the cheapening of electricity and gas supplies; no "vested private company rights to be included on any terms" in setting up the larger electricity authorities under the 1919 Act; the municipalisation of banking, coal and milk supply, hospitals and various trades; the securing of the fullest powers by the tramway authority for undertaking the whole passenger facilities in respect of taxi-cabs, 'buses, cabs, charabancs, and carriage of goods; the extension of the principle of direct labour so that the contract system shall be entirely abolished; a maximum 40-hour week, limitation of work to six days per week, and two weeks' annual holiday with pay. There is a long list of other Utopian promises, some practical and more otherwise. Nothing is said as to who is to pay for these things. Bradford is a noted hotbed of the wildest Socialism.

Fatality.—There was an unfortunate accident on October 20th at the Lister Drive electric power station, Liverpool, resulting in the death of a boiler man employed to clean the flues of a boiler which was under repair. In stepping over a revolving shaft his trousers were caught in a sprocket, and he was whirled round the shaft. He sustained terrible injuries, and, by the time he reached the hospital, succumbed. At the inquest, which was held on October 22nd, Mr. P. J. Robinson, Deputy City Electrical Engineer, said that a great deal of attention had been given to the safety of employés at the station, and this was the first accident for 20 years. There would have been no danger if deceased had chosen to step over a smooth part of the shaft. It had not been considered necessary to put a guard round the shaft. A verdict of "Accidental death" was returned.

The Duddell Memorial.—The wish has been generally expressed that there should be a memorial to the late Mr. W. Duddell, C.B.E., F.R.S., &c., by whose death in November, 1917, physical science suffered a severe loss. Duddell's work shows how largely electrical science and many of the scientific societies are indebted to him. The Council of the Physical Society considered, therefore, that his memory should be perpetuated, and invited the Councils of the Institution of Electrical Engineers and of the Rontgen Society to join in forming a committee to collect funds for a Duddell Memorial. It is proposed that the memorial shall take the form of a medal to be awarded periodically by the Council of the Physical Society, and at its discretion, to those who have advanced physical knowledge by the invention or design of scientific instruments, or of materials used in their construction. If sufficient funds are available after paying for the cost of the dies, and after providing for the cost of striking the medals, it is proposed to form a fund to be devoted to the foundation of scholarships or prizes to be awarded to students of the Physical Society under conditions to be determined by the Council. Subscriptions should be forwarded to the hon. secretary, Mr. Robert S. Whipple, 15, Creighton Avenue, Muswell Hill, London, N. 10. The preliminary list of subscriptions shows that a total sum of over £321 has already been given by 57 individuals and firms.

Barking Dogs Seldom Bite.—We hear that the County Council is taking steps to get a new muzzling order issued to keep the County Co. from barking.



[*After Bairnsfather.*]

M''z to K*****y: "Well, if you knows of a better 'ole, go to it."

The Engineering Training Organisation.—In our issue of the 15th inst. we briefly mentioned that the E.T.O. scheme had been entrusted to the Engineering Employers' Federation. This was the outcome of a step taken at the fourteenth meeting of the E.T.O. Executive on September 29th. Sir W. Ellis, G.B.E., was in the chair, and he explained that the E.E.F. and the F.B.I. had each offered to take over the work of the E.T.O., and that the E.T.O. Executive had been authorised by the E.T.O. Council to discuss the matter with them in all its bearings and to act definitely and finally upon its decision. The question to be determined, therefore, was whether the objects for which the E.T.O. was formed would be furthered better by the E.E.F. or the F.B.I. The standing of these bodies precluded the attachment of conditions to the impending transfer, and thus rendered a thorough discussion of the subject all the more important. Mr. J. E. Richmond, in outlining the position of the Engineering and the National Employers' Federations in relation to engineering training, said that it should be accepted as a fact that the active participation of the E.E.F. in all matters relating to engineering training was inevitable, and for this reason the Federation believed itself to be the natural agency through which the objects of the E.T.O. could best be realised. A definite development of activity in the immediate future was essential, and if the continuance of the E.T.O. work was administered elsewhere, as, for instance, by the F.B.I., overlapping and duplication seemed to be inevitable, and it seemed to the E.E.F. undesirable at this critical juncture to allow any seed of future confusion to be sown. Mr. W. Prescott, speaking for the F.B.I., explained that it had always been the policy of their educational section to abstain from direct participation in the details of training in any industry that had established, or was willing to establish, an efficient representative body for that purpose. Acting on this principle, they had recognised the E.T.O. as representing the engineering industry, and were prepared similarly to recognise the E.E.F. The appreciation of the F.B.I. for the work accomplished by the E.T.O., and the sense of their own responsibility towards the engineering industry was such, however, that they felt bound, in the first instance, to express their willingness to carry it on if asked to do so, and, in the second place, to stand aside when, but only when, they felt satisfied that the work would be properly done by someone else. On this understanding, and with the expressed intention of both bodies to co-operate in the fullest possible manner, Mr. Prescott said he would, if the E.T.O. Executive so wished, withdraw the F.B.I. offer in favour of that of the E.E.F. A discussion of the issue having ensued, the Executive decided to accept the offer of the E.E.F. to take over the E.T.O., and thereupon authorised Mr. A. E. Berriman to carry out all details of the transfer. The chairman said that he desired to express appreciation of the broad-minded attitude adopted by Mr. Prescott on behalf of the F.B.I. It had been the general wish of the Executive that the mantle of the E.T.O. should descend upon the F.B.I., and it was only the eleventh hour offer of the E.E.F. that had caused the enlargement of mind by which the best interests were now seen to be served in another direction. Everyone would wish, said Sir William Ellis, that it were possible to keep these educational questions removed from the atmosphere of labour controversies by which the E.E.F. was inevitably surrounded, but the E.E.F. was not altogether a free agent in its choice of subject matter, and the problems of engineering training, with their attendant educational principles, were being forced more and more under the direct notice of the E.E.F., and, for his part, he felt convinced of the wisdom of the Executive's present decision to entrust the E.T.O. work unreservedly to the E.E.F.

Resistance Furnace for Zinc Ores.—*Chemical and Metallurgical Engineering* describes a system devised by Prof. Charles H. Fulton for the treatment of zinc ores. The essential steps are: Oxidised zinc ore or roasted zinc concentrate is mixed with crushed coke and coal-tar pitch and formed into briquettes 9.25 in. in diameter and 21 in. long in a manner similar to that used in the manufacture of graphite or carbon electrodes, except that much less care and time are required. The composition varies with the nature of the ore. These briquettes maintain their form and volume during and after the distillation of the zinc. This object is gained by using coke as the matrix and coal-tar pitch as the binder; this pitch becomes coke on heating and unites the ore particle and the original coke particle into a continuous mass. The briquette is an electrical conductor, but only to such a degree that it can be used as a resistor.

The second step of the process consists in making the briquette part of an electric circuit as shown below and heating it by an electric current to such a degree that the zinc is distilled. During this operation, the briquette is covered by a movable retort and the zinc vapour and carbon monoxide are conducted to a condenser in which the zinc is condensed. During the distillation, the briquette acts as a continuous resistor and maintains itself unaltered between the terminal electrodes. As the furnace is not limited to the interposition of one briquette between the terminal electrodes, a large number may be interposed, thus giving a large unit furnace. While direct current may be used, alternating current is preferable on account of the ease of voltage control by means of transformers. The furnace at East St. Louis held a charge of 36 briquettes, arranged in twelve columns of three each, set within a circle and operated on a three-phase circuit, four columns in each phase, connected in the customary Y connection. The amount of charge in this furnace varied between 3,100 and 3,200 lb., the amount of ore being approximately 1,700 lb. The time of distillation was about 6 hours; the total time, including the placing and discharging, was 8 hours, or three charges worked off in 24 hours. The capacity of the furnace was 5,100 lb. of zinc concentrate per 24 hours. A proposed larger furnace, taking 12 briquettes weighing 600 lb. each, will have a capacity of about 8.5 tons of zinc concentrate per retort per 24 hours.

Set-up Zinc Furnace Briquette Charge.

New Type of Lamp.—The production of a searchlight that can be used to send invisible messages for naval purposes without the possibility of detection was the problem set by Admiral Bullard, of the U.S. Naval Communications Service, to the General Electric Co.'s engineers during an inspection of the company's works at Schenectady, on October 12th, by the British and foreign technical delegates to the International Communications Conference. Mr. W. D. Ryan, the company's electrical illumination engineer, promised to see what could be done to produce a cylindrical light core, rendered invisible by the use of infra-red rays. An incandescent lamp searchlight of 7,000,000 c.p. was shown to the visitors, who were told that experiments had demonstrated that it was possible to increase a 600,000 c.p. light to 1,200,000, without additional electrical power, by simply conserving light rays heretofore wasted by the employment of parabolic lenses. The laboratory had discovered that searchlight lenses, if built with mirrors curved on new lines not parabolic, would conserve most of the lost rays, and the discovery was about to be put to the practical use of doubling the power of existing searchlights.

INSTITUTION NOTES.

Manchester Association of Engineers.—Mr. Julius Frith, M.Sc., M.I.E.E., chose "Vibration" as the subject of a short paper which he recently read before the Society. The author first defined and gave examples of vibration, then passed on to the laws governing the time of vibration and their application to particular cases met with in engineering. He next considered the calculation of natural frequency; causes of vibration; cyclic irregularity, connection between speed and position error; and the effect of the cyclic irregularity of an engine synchronising with the natural frequency of its load. He showed that the natural frequency of an alternator was explainable on mechanical rather than on electrical grounds, and calculated the natural frequency of alternators. After outlining the causes of trouble and the natures of cure, the problem of running alternators in parallel was discussed.

Société des Ingenieurs Civils de France.—The British Section of the Society intends to hold four or six meetings during the 1920-21 session. The first is to be held at the Hall of the Royal Society of Arts, John Street, Adelphi, W.C., on November 9th. M. Edouard Gruner, President of the Society, is coming from France to address the meeting.

Faraday Society and Institute of Metals.—A joint meeting organised by the Faraday Society and the Sheffield Section of the Institute of Metals will be held in the Mappin Hall of the University of Sheffield, St. George's Square, on November 19th, to discuss papers dealing with various aspects of electroplating. Communications are promised from representatives of the scientific side of the electroplating industry in London, Birmingham, and Sheffield. Those desirous of taking part are invited to communicate with the Sheffield local hon. secretary of the Faraday Society, Dr. F. C. Thompson, Department of Applied Science, University of Sheffield.

Institute of Transport.—The first general meeting of the Institute of Transport was held on October 18th at the Institution of Civil Engineers, Westminster, and was attended by a large number of members. In the unavoidable absence of Sir Eric Geddes, M.P., the retiring president, the chair at the outset was occupied by Sir Joseph Broodbank, who said that much of the success the Institute had achieved was due to Sir Eric Geddes and Mr. H. E. Blain (the hon. secretary). In presenting its first annual report, the Council mentioned that there was now a roll of 652 members, including 45 graduates and 31 students. The entrance fees amounted to £1,473, and subscriptions aggregated £1,210. A diploma for members, and another for associate members had been approved, and would be issued at the earliest moment; premiums and medals would be awarded for papers to be contributed, and arrangements had been made for a course of lectures on traffic subjects. Lord Ashfield of Southwell afterwards took the chair as the new president, and in the course of his address, he dealt with important aspects in the progress of transport, and suggested lines of policy for developing a plan which would deal with the educational activities and aims of the Institute.

Institution of Electrical Engineers.—Liverpool Sub-Centre of the North-western Centre.—The opening meeting of the 1920-21 session will be held on Monday next at 7 p.m. in the lecture theatre of the laboratories of applied electricity at the university. Mr. Ll. B. Atkinson, president of the I.E.E., will address the meeting and Mr. H. Dickinson, chairman of the Liverpool Sub-Centre, will deliver the chairman's address.

Institute of Patentees (Inc.).—An institute with the above title, from which the word "limited" is omitted by licence of the Board of Trade, was registered on October 18th, as a company limited by guarantee. The management is vested in a Council, and the organising secretary is Mr. G. D. Coleman, with registered offices at 6, Holborn Viaduct, E.C. 4.

Institution of Civil Engineers.—The one hundred and second session will be opened on Tuesday, November 2nd, at 5.30 p.m., when Mr. John Alexander Brodie, President, will deliver an address and present awards made by the Council for papers dealt with during the past session.

Paisley Association of Electrical Engineers.—Mr. W. R. Bruce, the president, in an address to the Association, dealt with "The Development of Electric Traction on our Main-line Railways."

Chelmsford Engineering Society.—On October 21st, at the second meeting of the new session, Mr. E. H. Field lectured on "Electric Traction" before a large attendance of members; Mr. A. Eddington in the chair. The paper reviewed the present position of electric traction on railways in this country and abroad, and drew attention to the part played by national conditions as regards cost of coal, abundance of water power, severe gradients, &c., in the more rapid development of main-line electrification in Europe and America, compared with Great Britain. The requirements of main-line, suburban, and city railways were described, and the importance of rapid acceleration for short runs was emphasised. In this connection comparison was made between the high acceleration attained on city and suburban electric railways, and the best figures obtainable with steam locomotives. The merits and disadvantages of D.C., single-phase, and three-phase systems were compared, and reference was made to the 3,000-volt D.C. electrification of a large section of the Chicago, Milwaukee, and St. Paul Railway, the report in favour of the use of high-voltage D.C. issued by the French Railway Mission to the United States, and the report of a British Railway Commission standardising 1,500 volts D.C. for railway electrification in this country. On the subject of locomotives, the paper discussed the gearless, geared, and side-rod methods of driving. Lantern slides were employed to illustrate the paper, these including photographs of some of the recent large locomotives made in Switzerland and the United States. In the discussion that followed, Mr. Burge, M.I.E.E., dealt with the difficulties that confronted the electrical engineer in traction work, and Mr. Buyers, M.I.E.E., related some interesting experiences in traction work.

The Faraday Society.—On Monday the symposium arranged by the Faraday Society and the Physical Society on the physics and chemistry of colloids was held at the Institution of Mechanical Engineers, Sir Robert Hadfield presiding. Prof. Dr. The Svedberg, of Upsala, read the first paper, and pointed out the immense importance of colloids, of which all living beings, food, clothing, &c., were built up.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

The L.C.C. Highways Committee has appointed Mr. J. P. Crouch, of the Metropolitan Carriage & Wagon Co., Ltd., to act with the general manager as assessor of the designs for new tramcars, at a fee of 250 guineas.

Mr. J. T. Fayle, temporary traffic manager of the light railways at Southend-on-Sea, has been appointed permanently by the T.C. at his existing salary.

At a meeting of the Blackburn branch of the National Association of Local Government Officers, on October 20th, Mr. T. Wallwork, mains superintendent of the Corporation electricity department, one of the founders, was presented with a gold albert, and Mrs. Wallwork with a gold wristlet watch in recognition of services rendered to the branch. The presentations were made by Mr. F. P. Wheelwright, the electrical engineer.

Mr. F. T. Billings, who was for 10 years with Jones and Attwood, Ltd., of Wordsley, Stourbridge, has accepted an appointment as electrical engineer with the Burmah Electric Tramways & Lighting Co.

The marriage took place at St. James's Church, Forest Gate, on October 15th, of Mr. E. W. Jackson, A.M.I.E.E., son of Mr. J. Jackson, of Bognor, and Miss Eileen Mary Taylor, only daughter of Mr. T. S. Taylor, of Forest Gate.

At the forthcoming municipal election which takes place at Stockton-on-Tees on Monday, Mr. G. P. Fairless, who is managing director of the Fairless Engineering Supplies Co., Ltd., of Stockton-on-Tees, director of Fairless Electric Welding's, Ltd., of Stockton-on-Tees, and chairman of directors of the Engineering and Lighting Equipment Co., Ltd., of St. Albans, Herts., is contesting the Central Ward as an independent candidate. His opponent is fighting for the labour and co-operative cause.

Obituary.—Mr. D. Coyle.—On October 25th, at 17, Addison Road, Bedford Park, London, the death occurred of Mr. Daniel Coyle, M.I.E.E. The interment will take place at Charlton Cemetery at 11 a.m. to-morrow (Saturday). Australasian and Japanese papers please copy.

NEW COMPANIES REGISTERED.

Vickers South Africa, Ltd. (170,990).—Private company. Registered October 22nd. Capital, £10,000 in £1 shares. To carry on the business of metal founders and workers, shipwrights, builders and repairers of war and other ships, including submarines, dealers in machinery, tackle, ships' furniture and stores, manufacturers of and dealers in guns, gun carriages, torpedoes, ordnance, electricians, electrical engineers, &c. The first directors are: F. H. Barker, Lowndes House, Lowndes Place, Belgrave Square, S.W. (director, Adam Hilger & Co., Ltd., British Lighting & Ignition Co., Ltd., &c.; S. V. Bardier, 48, Grange Road, Ealing, W. (director, Complete Gas Combustion Co., Ltd., Salvage & Towage Co., Ltd., &c.); N. Robinson, Westmoor Green House, near Slough (director, Vickers-British East Africa, Ltd., &c.) Secretary (*pro tem.*): C. E. Bardier. Registered office: Vickers House, Broadway, Westminster, S.W.

Grindlay, Ross & Co., Ltd. (11,457).—Private company. Registered in Edinburgh, October 18th. Capital, £10,000 in £1 shares. To carry on the business of electrical engineers and contractors, manufacturers of and dealers in electric, magnetic, galvanic, and other apparatus. The first directors are: J. S. Paul, 81, St. Vincent Street, Glasgow; J. Marr, 926, Govan Road, Govan, Glasgow; J. Grindlay, Glasgow; J. P. Grindlay, Glasgow. Registered office: 141, Reid Street, Bridgeton, Glasgow.

"Z" Electric Lamp & Supplies Co., Ltd. (170,924).—Private company. Registered October 19th. Capital, £30,000 in £1 shares. To carry on the business of electricians, electrical and mechanical engineers, &c. The first directors are: W. Crawford, Orient House, New Broad Street, E.C. J. Scrivener, 146, Wimbledon Park Road, Southfields, S.W.18; A. G. Marsh, 274, Durnsford Road, Wimbledon Park, S.W. Secretary: L. W. Ellisdon. Registered office: 71, Standen Road, Southfields, S.W.

General Electrical Construction & Maintenance, Ltd. (170,915).—Private company. Registered October 19th. Capital, £1,000 in £1 shares. To carry on the business of electricians, electrical and mechanical engineers and contractors, manufacturers, exporters and importers of cable, wire, lines, accumulators, dynamos, &c. The first directors are: P. O. Knowles, junr., 36, Castle Hill Avenue, Folkestone; A. D. Clarke, 30, Shirley Road, Enfield, Middlesex. Registered office: 47, Imperial Buildings, Ludgate Circus, E.C. 4.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

W. Sisson & Co., Ltd. (82,295).—Return dated October 1st, 1920 (filed October 7th). Capital, £50,000 in £1 shares (5,000 preferred, 38,000 ordinary, and 7,000 deferred); 4,375 preferred, 27,311 ordinary, and 7,000 deferred shares taken up. £24,286 paid. £14,400 considered as paid. Mortgages and charges, £6,224 15s. 6d.

Stearn Electric Lamp Co., Ltd. (95,340).—Return dated July 23rd, 1920 (filed July 31st). Capital £4,070 in £10 shares. All shares taken up, £70 paid, £4,000 considered as paid. Mortgages and charges, nil.

Spanish Telephone Co., Ltd. (41,589).—Return dated August 2nd, 1920. Capital, £81,000 in 5,000 ordinary shares of £10 each and 1,250 preferred shares of £20 each; 5,000 ordinary and 671 preferred shares taken up; £33,420 paid, £16,000 considered as paid. Mortgages and charges, nil.

J. G. White & Co., Ltd. (66,568).—Return dated July 13th, 1920. Capital, £500,000 in £1 shares (180,000 preferred and 320,000 ordinary), 180,000 preferred and 200,000 ordinary shares taken up; £150,000 paid, £230,000 considered as paid. Mortgages and charges, nil.

D.P. Battery Co., Ltd. (44,084).—Return dated July 27th, 1920. Capital at date of return, £10,000 in £1 shares (4,996 "A," 4,996 "B," and 8 others). All shares taken up; £10,000 paid. Mortgages and charges, £18,000. Capital increased to £100,000 in £1 shares on September 2nd, 1920. Two returns of allotment made up to August 20th and September 1st shows the whole of the additional share capital allotted, of which 18,000 shares have been allotted for cash and 72,000 distributed among the shareholders by way of bonus.

Christy Brothers & Co., Ltd. (90,039).—Return dated November 21st, 1919 (filed August 3rd, 1920). Capital, £22,000 in £1 shares (14,000 ordinary, 3,000 deferred, and 5,000 7 per cent. cumulative preferred). 10,537 ordinary, 3,000 deferred, and 250 preferred shares taken up, £4,687 paid, £9,100 considered as paid. Mortgages and charges, £4,600.

Oliver Engineering Co., Ltd.—Issue on October 18th, 1920, of £300 debentures, part of a series already registered.

Thermo-Electric, Ltd.—Debenture dated October 5th, 1920, to secure £13,591, charged on the company's undertaking and property, present and future, including uncalled capital and interest in 16,308 fully-paid shares in Burma Finance & Mining Co., Ltd., and proceeds thereof, subject to prior charges for £100,000, £50,000, and £50,000 respectively. Holders: Electric Furnaces & Smelters, Ltd., and others.

British Electric Vehicles, Ltd.—Particulars of £50,000 debentures, authorised October 1st, 1920, and covered by trust deed of even date; amount of present issue £25,000; charged on leasehold property at Cambridge Road and Marshside Lane, Southport, and the company's undertaking and property, present and future, including uncalled capital. Trustees: Copleys' Bank, Ltd.

Torquay Tramways Co., Ltd.—Satisfaction to the extent of £1,000 on October 6th, 1920, of charge dated March 8th, 1911, securing £60,000.

Van Raden & Co., Ltd.—Mortgage dated October 1st, 1920, to secure £1,000, charged on certain freehold land and factory premises at Great Heath, Foleshill, Coventry. Holder: J. Rankin, Mains of Cairnbrocks, Leswalt, Stranraer, Wigtownshire.

Corona Lamp Works, Ltd.—Mortgage dated October 14th, 1920, to secure £1,200, charged on the Lysander Grove, Islington, N. Holders: Portman Chapel Temperance Benefit Building Society.

E. Timmins & Sons, Ltd.—Particulars of £10,000 debentures authorised August 31st, and covered by trust deed of September 28th, 1920, present issue £9,350; charged on certain freehold lands and premises at Runcorn and the company's undertaking and property, present and future, including uncalled capital. Trustees: London County Westminster & Parrs Bank, Ltd.

CITY NOTES.

Drake and Gorham, Ltd. The report for the year ended June, 1920, states that after payment of all charges, including bonuses due to staff, and making provision for all contingencies, there is a net profit of £23,017, plus £6,717 brought forward, making £29,734, which it is proposed to appropriate as follows: Payment of a dividend of 10 per cent. for the year, £12,500; writing down goodwill, £5,000; and carrying forward £12,234, subject to deduction for excess profits duty and corporation tax. During the year the head offices of the company have been removed to 36, Grosvenor Gardens, the lease of which has been purchased to 1955, subject to a nominal ground rent. This investment, added to the requirements of the business under existing conditions, necessitates additional working capital, which is receiving the attention of the directors. Payment of the dividend declared will therefore have to be deferred. In spite of the dislocation in reverting from war to peace requirements, the turnover is again greater than that of the previous year, while the orders in hand indicate a further material expansion during the current year. Although the available profits on contracts have been adversely affected by the increasing cost of labour for which it has been difficult to make adequate provision, it is anticipated that in this respect conditions will improve, and current orders show better results. The directors have voted £673, being part of the extra remuneration to which they are entitled under the articles of association, towards the staff bonus account.

North Melbourne Electric Tramways & Lighting Co., Ltd.—The report for the year ended September 30th, 1919, states that the gross receipts show an increase from £44,203 to £45,764, and the expenses increased from £33,825 to £34,536, due mainly to the increase in wages and cost of materials. The net revenue was £11,228, as compared with £10,379; £8,350 has been absorbed by payment of debenture interest and £2,878 has been transferred to reserve for renewals, making that fund £11,830. The business was adversely affected by the strike of seamen.

Montreal Tramways Co.—The report for the year ended June 30th, 1920, states that gross revenue amounted to $2,375,579 and expenses to $1,923,071, leaving net income $452,508. Three quarterly dividends of 2½ per cent. each absorbed $290,550, leaving a balance of $161,958, which, added to $1,039,818 brought forward, makes a total of $1,201,776, from which there has been appropriated $255,601 on account of deferred dividends paid during the year and $5,000 voted to the widow of one of the officials, leaving a general surplus account of $941,176. From February 10th, 1918, to June 30th, 1920, the revenue has not been sufficient to meet the requirements under the new contract, the shortage being $1,728,912, of which $1,192,694 is payable to the City of Montreal when received, after payment of all prior charges and $223,547 to the contingent reserve fund.

Electric Supply Co. of Victoria, Ltd.—The accounts for the year ended March 31st, 1920, show that the revenue was £105,053, against £101,220 in the previous year; the expenditure £69,712, against £67,159 for 1918-19, and the gross profit £35,341, against £34,061. Lamps connected 268,544, against 252,407 the previous year; tramway passengers 5,316,136, against 4,898,102. The balance to the credit of profit and loss account is £33,764, plus £24,136 brought forward, making £57,900 less £14,796 for debenture interest and charges. It is proposed to pay on account of arrears of preference dividend £10,500 and to carry forward £43,103. Debenture stock redeemed to date £81,642. The meeting was held in London on October 13th.

Stock Exchange Notices.—The Committee has ordered the following to be officially quoted:—

Callender's Cable & Construction Co., Ltd.—100,000 ordinary shares of £1 each, fully paid (Nos. 400,000 to 500,000).

Vickers, Ltd.—7,653 ordinary shares of £1 each, fully paid (Nos. 12,307,981 to 12,315,633); and 18,065 5 per cent. cumulative preference shares of £1 each, fully paid (Nos. 6,845,763 to 6,863,827).

Prospectus.—*W. H. Dorman & Co., Ltd.*, are issuing £300,000 8 per cent. participating seven-year notes at £95, together with 50,000 ordinary shares at 22s. per share.

Kaministiquia Power Co.—Dividend of 2 per cent., being at the rate of 8 per cent. per annum on the common stock for the quarter ending October 31st.

Babcock & Wilcox.—Interim dividend at the rate of 1s. 4½d., equal to 7 per cent., free of tax, for the past six months.

United River Plate Telephone Co., Ltd.—Interim dividend at the rate of 6 per cent., free of tax, on the ordinary shares for the half-year.

Brisbane Electric Tramways Investment Co., Ltd.—Interim dividend of 8 per cent. per annum, free of tax, on ordinary shares for the half-year.

STOCKS AND SHARES.

TUESDAY EVENING.

STOCK EXCHANGE markets started off the week with a surprising degree of strength. Surprising, that is, in the light of the uncertainty which still existed with regard to the strike outlook. The public evidently take the view that at the Wednesday conferences this week agreement will be reached between the Government and the railwaymen and also, it is hoped, between the Government and the coalminers. On the strength of the strike-fever abating, buying orders poured into the markets in liberal fashion during Monday and Tuesday. There was something of a halt towards the latter end of business to-day (Tuesday), but the strength of markets continued to be well maintained, and, although some of the buyers admit that they are skating upon fairly thin ice, confidence runs high in the expectation of sanity regaining the upper hand and labour returning to its ordinary avocations.

In these circumstances, prices responded with improvements in nearly all the markets round the Stock Exchange. It is not as though the movement were purely sentimental either. Improvement in prices has been brought about by a considerable volume of buying stimulus, and this, coming upon a market in which there was no great amount of floating stock, caused the all-round appreciation of values. It can hardly be said that any one market commands greater prominence than the other in this advance, although oil shares, as usual, monopolise the greater part of the speculative investor's interest at the present moment.

Home Railway stocks went ahead with the rest. Even those of the steam lines participated in the buoyancy which spread from one end of the House to the other. Amongst Undergrounds, one of the features is the strength of the £10 shares of the Underground Electric Railways Company. These rose 5s. to 2½, and the income bonds at 70½ show a gain of 2 points. The "A" shares are sixpence better at 7s. 6d. Metropolitans and Districts have been inclined to lag behind the others; indeed, the prices of both are 10s. lower on the week. Several of the prior-charge issues are also harder, and the monetary outlook is quoted as being likely to exhibit some degree of ease in the near future. Possibly the Stock Exchange and its clients may be rushing the improvement rather too quickly, but it must be admitted that the fall has been protracted, and that, although prices had not slumped so severely as many people expected them to do, the hope of labour conditions being settled on a more permanent basis of peace is sufficient to pluck up the courage of many people who for weeks past have been afraid to adventure their capital in stocks and shares.

Amongst home electricity shares, Chelseas at 2½ have lost the fraction which they gained a week ago, and Brompton ordinary at 6 now return the level 10 per cent. on the money. Westminster ordinary at 5 pay the same rate, and London Electric preference can be bought at 3, also to give 10 per cent. County ordinary at 7½ return little short of 11 per cent., allowing for accrued dividend in the price, while City Lights, obtainable at 22s. 6d., offer the investor nearly 9 per cent. If South Londons could be bought (and they are extremely difficult to get), the return would be over 9½ per cent. on the money, while Charing Cross offer 10½ per cent. These are big yields even in days like these, and, as this is the season of the year when interest in illumination shares is generally quickened, there might be a chance for improvement if the coal outlook were to become less obscure.

The City of London Company has taken the bold step of counselling its customers to use as little light as possible during the crisis, and, with the return of Greenwich time, it suggests that everything should be done in order to speed up work in offices, &c., with a view to enabling an early return home in the evening and a corresponding saving of electric current. No one will suppose that investors are likely to pay any particular attention to electric lighting shares so long as the coal situation continues critical, but if this were to become more normal, it might be worth the while of people, who are prepared to wait for capital appreciation, if they started to buy a few of the best-class lighting shares.

Edisons at 18s. are another 1s. down, and British Insulated receded to 1½. India-rubber shares at 1 3/16 are also 1/16 lower, but on the other hand, British Aluminiums recovered to 20s., and Babcock & Wilcox have risen to 2½ on the pleasantly-unexpected increase in the interim dividend from 6 per cent. to 7 per cent. This came as a surprise, for most people had assumed that companies of this class were not likely to do more than maintain their previous rates. Other manufacturing shares are steady. There has been a little buying of General Electrics, raising the price to 26s. 3d., and Siemens at 24s. 6d. have regained their last week's decline.

Amongst cable shares, Westerns have risen to 15, and so stand higher than the other three partners in the quartette, which comprises Eastern Extensions, Eastern Telegraph ordinary, and Globe ordinary. The principal feature in this market is the recovery in Marconis, the shares having risen to 2½ on speculative purchases. For some time past the market has been in disfavour owing to the Government action with regard to the wireless chain which it is sought to set up. There was a rumour current lately to the effect that Mr. Godfrey Isaacs might sever his connection with the Marconi Company, but for this there appears to be no foundation. Marconi Marines have recovered with the parent shares, and are now 29s., but Canadians hang fire, remaining at 9s. 6d. Chadburn's Telegraph ordinary are lower at 17s. 6d., and the preference have eased off to 16s. 3d.

Mexicans are moving aimlessly, the 5 per cent. bonds of the Mexico Tramways Company shedding 1½, while Mexican Light and Power first mortgage bonds rose a similar amount. Anglo-Argentine 5 per cent. debenture stock has put on a couple of points to 59½, and British Columbia Electric preferred and deferred stocks added a further 2 apiece to their previous week's rises of 3. The company's traffics are good, and encourage the idea that an increase may be made in the 3½ per cent., free of tax, dividends last declared on the preferred and deferred stocks.

Rubber shares stiffened a trifle, on the expectation that the industry will benefit from the coming into force next Monday of the curtailment policy, under which 70 per cent. of the British producers have agreed to a reduction of 25 per cent. in their normal output of rubber. The price of raw rubber, however, shows little indication at present of improvement. Amongst armament shares, Armstrongs and Vickers have recovered sharply, and from their recent low levels of 20s., have both mounted to 23s. An interesting issue this week is that of three million pounds 8 per cent. seven-year notes at 96½ by the Explosives Trades, Ltd., the security of which renders the offer attractive. "Dollar" stocks are disposed to yield ground, on the American exchange movements. Havana Electric Railway 5 per cent. bonds at 100 are 7½ points lower, and others of the same class are mostly lower.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1918.	Dividend 1919.	Price Oct. 25, 1920.	Rise or fall.	Yield p.c.
HOME ELECTRICITY COMPANIES.					
Brompton Ordinary	5	13	6	– ½	£10 0 0
Charing Cross Ordinary	4	7	8½	–	10 15 6
do. do. 4½ Pref.	4½	4½	9¼	–	8 8 8
Chelsea	3	4	2½	– ½	7 5 6
City of London	8	10	14	–	8 17 10
do. do. 6 per cent. Pref.	6	6	17/8	–	6 17 3
County of London	7	8	7¼	–	10 17 9
do. do. 6 per cent. Pref.	6	6	8½	–	7 7 8
Kensington Ordinary	6	7	9¼	–	9 0 6
London Electric	Nil	3½	1	– ½	7 10 0
do. do. 6 per cent. Pref.	6	6	8	–	10 0 0
Metropolitan	6	6	9½	–	12 6 8
do. 4½ per cent. Pref.	4½	4½	2½	–	8 0 0
St. James' and Pall Mall	10	12	6¼	–	9 4 8
South London	5	5	2½	–	9 12 0
South Metropolitan Pref.	7	7	15/3	–	8 12 6
Westminster Ordinary	3	10	5	–	10 0 0
TELEGRAPHS AND TELEPHONES.					
Anglo-Am. Tel. Pref.	6	6	77½	–	7 14 10
do. Def.	22/6	1½	17½	–	8 15 10
Chile Telephone	5	5	5½	–	*5 9 1
Cuba Sub. Grd.	7	7	6½	– ½	*10 15 4
Eastern Extension	8	10	14½	–	*8 15 7
Eastern Tel. Ord.	8	10	14½	–	*8 15 7
Globe Tel. and T. Ord.	8	10	14½	–	*6 16 9
do. do. Pref.	6	6	8½	–	7 1 2
Great Northern Tel.	22	23	20	–	11 0 0
Indo-European	18	19	20	–	8 8 8
Marconi	35	36	37	+ ½	8 13 10
Oriental Telephone Ord.	10	13	22	–	*4 13 4
United R. Plate Tel.	8	8	6½	– ½	*6 10 8
West India and Panama	1/8	Nil	¼	–	Nil
Western Telegraph	8	10	15	+ ½	*6 13 4
HOME RAILS.					
Central London Grd. Assented	4	4	43½	–7	9 4 0
Metropolitan	1	1½	20½	– ½	6 3 5
do. District	Nil	Nil	18	– ½	Nil
Underground Electric Ordinary	Nil	Nil	2½	+ ½	Nil
do. do. "A"	Nil	Nil	7/6	+6d.	Nil
do. do. Income	5	4	70½	+ 2	—
FOREIGN TRAMS, &c.					
Anglo-Arg. Trams First Pref.	Nil	5½	8	–	9 3 4
do. do. 2nd Pref.	Nil	Nil	8½	–	Nil
do. do. 5 Deb.	5	5	59½	+2	8 8 0
Brazil Tractions	Nil	Nil	44	–	Nil
Bombay Electric Pref.	6	6	12½	–	4 16 0
British Columbia Elec. Ry. Pfce.	5	5	51	–	9 6 3
do. do. Preferrred	2½	5	55½	+2	*6 7 2
do. do. Deferred	Nil	2	55½	+2	*6 7 2
do. do. Deb.	4½	4½	58½	–	7 19 0
Mexico Trams 5 per cent. Bonds	Nil	Nil	42½	– 1½	Nil
do. 6 per cent. Bonds	Nil	Nil	33	–	Nil
Mexican Light Common	Nil	Nil	15	–	Nil
do. Pref.	Nil	Nil	27½	–	Nil
do. 1st Bonds	Nil	Nil	61½	+1½	Nil
MANUFACTURING COMPANIES.					
Babcock & Wilcox	5	6	32	+ ½	*6 18 4
British Aluminium Ord.	10	10	1	+ ⅝	10 0 0
British Insulated Ord.	13½	15	14	– ½	9 4 8
Callenders	25	15	17	– ½	10 8 8
6 6% Pref.	6½	6½	18/9	–	6 18 8
Castner-Kellner	20	17	8	–	5 18 4
Crompton Ord.	10	10	17/6	–	11 8 6
Edison-Swan, "A"	10	10	18/-	– 1/-	11 10 5
do. do. 5 per cent. Deb.	5	5	15½	–	6 12 6
Electric Construction	10	10	18/9	–	10 19 2
Gen. Elec. Pref.	6½	6½	18/6	–	7 0 5
do. Ord.	12	10	1..	+9d.	7 12 4
Henley	25	15	18	–	9 4 8
do. 4½ Pref.	4½	4½	3..	–	7 4 0
India-Rubber	10	10	1..	–	18 8 5
Met.-Vickers Pref.	—	8	2..	–	7 6 2
Siemens Ord.	10	10	24/6	+6d.	*8 4 8
Telegraph Con.	20	20	20	–	6 0 0

* Dividends paid free of Income Tax.

POWER FACTOR.

By C. TURNBULL, M.I.E.E.

The discussions on my articles on power factor have been interesting and stimulating. I have reason to believe that something will come out of them, and that commercial interest in the subject will be increased. Power companies are wakening up to the commercial meaning of low power factor, and in the future we shall see a great deal more interest taken in the subject than has been in the past.

My personal belief is that the way to deal with low power factor current is to meter the wattful and the wattless components separately, and to make a charge to suit each case. This, of course, only applies to large consumers, say, to people paying something of the order of £500 or £1,000 per annum and upwards.

Messrs. Harvey and Dorey appear to have a dislike to the mechanical analogy. They are not alone in this dislike, but the fact remains that some of our greatest authorities, such as Clerk Maxwell, and Kelvin, made ample use of the mechanical analogy, and they knew something about theory also.

To come to the question of what wattless currents really are, Mr. C. H. Harvey, B.Sc. (London), writes:*

"Mr. Turnbull states that at one part of the cycle current comes from the generator and at another part it receives current as a motor. . . . This "wattless" current is there all the time, a varying portion of the measured current at times in the cycle, and an opposing current preventing a portion being measured at other times, but always there, as an alternating current, never taking power from the generator (it causes heat losses in the copper and iron, but this only adds a small percentage to the power current, and is measured as power to the regret of the consumer), and never giving power back."

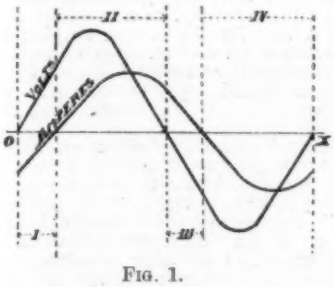


Fig. 1.

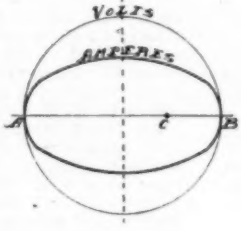


Fig. 2.

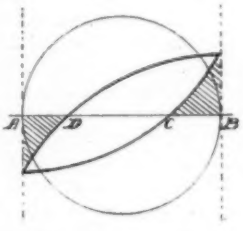


Fig. 3.

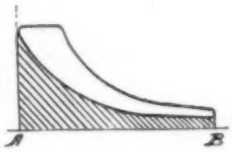


Fig. 4.

After reading this statement of Mr. Harvey's, I turned up Silvanus P. Thompson's "Polyphase Electric Currents." The following extract from Thompson's book will serve to show the difference between his ideas and those of Mr. Harvey (see fig. 1).

"During the partial periods II and IV, when there is agreement in sign, the machine is in the condition of being a generator, and will require to be driven, the currents in the armature setting up a counter torque. But during the other partial periods I and III, when there is opposition in sign, the machine is in the condition of being a motor, and will tend to drive itself, the torque helping it on."

Mr. Harvey and Dr. Thompson differ, and I propose to assume that Thompson is right.

If Mr. Harvey will read carefully Dr. Drysdale's book on alternating current with its wealth of mechanical analogies, he will get a new light on the whole subject of alternating current.

It may help to make the subject clearer if we depart from the ordinary method of representing currents by means of curves having a base line of time, and make use of a base line representing space. This will give us an accurate comparison with the indicator diagram of a steam engine.

In fig. 2 let the conductor C move to and fro with a harmonic motion along the line A B, in a magnetic field, the conductor being at right angles to the paper, so that we see the end only. Let it slide on bars which serve as contacts to our instruments. Then a voltage will be generated along the conductor, and (with a suitable scale) the voltage curve will be represented by a circle, as shown. If we draw off current through a plain resistance the current curve will be a circle, or an ellipse, according to the amount flowing. Let it be represented by the ellipse as shown in the figure. The ampere diagram is thus something like that given by a reciprocating engine.

Now let us draw off the current through a resistance and inductance in series. The effect, per fig. 3, will be that when the conductor gets to B, the current will continue to flow under its momentum, and will, in fact, flow against the voltage when the conductor is returning. In the diagram it does not cease to flow until the conductor has returned to the point C, after which it reverses and flows with the voltage. When the conductor reaches A, the current also continues to flow in the same direction, and does not reverse until the conductor reaches D on the return journey.

When the current is flowing against the voltage, the conductor is being motored instead of driven, as explained by Dr. S. P. Thompson.

Let us now consider the engine diagram. We take that of an oil engine, as it has large compression, which suits our purpose when we want to talk about out-of-phase currents. It is shaped somewhat as shown in fig. 4, and we get something which corresponds very closely to the electrical diagram. When the piston moves from A to B the compressed gases do work on it, but on the return stroke the piston does work by compressing the gases, the effect being similar to out-of-phase currents.

Where is the wattless component in these two cases? It is represented by the part hatched in each diagram. Probably people do not often think that a reciprocating engine diagram does show a wattless component, but it is there plain enough, when one looks for it. The effect, in the case of the electric generator and the reciprocating engine, is precisely similar. In each case one gets no loss shown on the indicator diagrams. Yet in each case we require bigger plant where there is a wattless component; the engine requires a bigger cylinder, and the generator requires heavier conductors.

Likewise the wattless component brings about a real loss in each case. In the engine there is leakage, and increased friction over what would take place if one could run without compression, while in the generator there is inevitable loss owing to the larger current flowing in it and in the mains.

If we seal up the engine cylinder altogether, and drive it by an outside source of power, at the same time leaving sufficient clearance at the cylinder end to keep the pressure within reason, we get a diagram something like fig. 5. This diagram is wattless, that is, there is as much power (or nearly as much) given on the motor stroke as is absorbed by the compression stroke. Let it be noted that although the diagram is wattless, the

* In view of Mr. Harvey's letter in the Electrical Review of October 8th, in which he withdrew part of his criticism, the author had thought of cancelling this reference; he has, however, let it stand because it probably represents the view of other readers.

stresses on the engine are quite as great as if it were doing work all the time. Likewise, although the diagram is wattless, power is required to drive the engine, to make up for friction losses. We assume a flywheel so large that the engine runs steadily requiring a practically steady power to drive it.

If the periodicity were reduced to one per two minutes we would see low P.F. in quite a different form. With the generator running on nearly wattless load, we would see that it was running on load for one minute, while during the next minute the current would be surging back and motoring the generator. It would in fact be necessary to put some kind of brake on it to prevent it from running away.

We are now in a position to see what is the function of a wattless meter. Current at low P.F. may be analysed into wattful and wattless current, just as the steam engine diagram may be analysed into the working part and the compression part. It is possible to get meters so arranged that one will meter only the wattful component, while the other will meter the wattless component. At first sight it might seem ridiculous to state that a wattless meter showed 100,000 units, but this

FIG. 5.

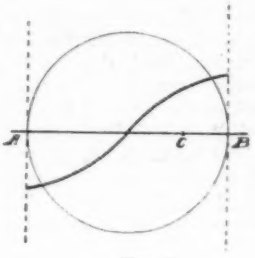


FIG. 6.

really means that the consumer has taken 100,000 units from the mains and has put them back again as current. He is like the banker's client who pays in £100,000 and draws it out again for expenses, a very usual business with banking accounts, as Mr. Dorey should know! It might seem that the two transactions balance each other, but they do not. The banker has to provide a staff of clerks, &c., to deal with the money. Similarly there is not a true balance with the electricity suppliers. They have to supply mains and plant to deal with the extra current which is required owing to the low P.F. The banker charges for his services on the turnover, and similarly electricity suppliers may reasonably make a charge on their turnover, as shown by the wattless component meter. This system seems to be the most equitable possible. The consumer can either pay for his wattless units, or he can improve his plant to use less of them.

Before the method can be put into full operation, it will doubtless be found necessary to explain the why and wherefore of it all to hard-headed business men. The northern ones, at any rate, like to know what they are paying for! For this purpose the banker's analogy may be found useful. The day may come when Messrs. Harvey and Dorey will both be glad to make use of it!

Electricity in Hamburg.—The working of the Hamburg electricity works in which the State of Hamburg holds a large financial interest has resulted in net profits of 10,122,000 marks in 1919-20, as compared with 4,136,000 marks in the preceding year, and the dividend on the ordinary shares is at the rate of 8½ per cent., as against 5 per cent. in 1918-19. The better results are attributed to improvements made in the plant which have permitted of the realisation of economies, particularly in the consumption of fuel. On the other hand, the Hamburg Elevated Railway, which is also a jointly owned undertaking, is unable to earn sufficient to defray the working expenses, and the sum of 3,000,000 marks has to be provided quarterly out of State funds to pay bonuses to the employés. It is thought that the railway will soon have to be transferred entirely to the State, which has guaranteed the dividend on the old shares, unless the income can be raised so as to meet the current working expenses.

THE REGAN TRAIN CONTROL SYSTEM.

EXPERIENCE has shown conclusively that an intelligent mind and a skilful hand must at all times be used in operating and controlling a high-speed train. The mind, however, is subject to lapses or distractions; the human mind functions at times somewhat independently of the being whom it controls; at times somewhat mechanically. The quick and accurate functioning of the human mind should not, therefore, be depended upon, as a last resort, where human life is at stake. In this connection it is interesting to recall that in reporting on recent railway accidents in this country Ministry of Transport inspectors have pointed out the desirability of the early introduction of automatic train control on British railway systems.

The necessity for automatic train control must be apparent because of the fact that even where automatic block signals are installed there is no absolute protection. An automatic signal is connected to the train behind which it stands; but there is no tangible connection between the signal and the approaching train, and thus a dangerous gap remains unspanned. Automatic train control is designed to bridge this gap; by its use conditions ahead actually control the approach of the train behind. Automatic train control is particularly essential to safe and economical operation where, as in the lowlands of England, at times dense fogs prevail. With trains properly equipped with the "Regan" automatic train control devices, including cab signals high speed can be safely maintained and the fogmen and special flagmen ordinarily used to safeguard traffic may be assigned to other duties.

On September 30th last, preliminary demonstrations (official tests are to follow later) were carried out on the Great Eastern Railway Co.'s system between Grange Hill and Fairlop, Essex, in the presence of officials of the Ministry of Transport, railway engineers, and other interested personalities, with the "Regan" Safety Devices Co.'s automatic train-control system, which we describe hereunder. Before going further, however, it might be well to point out that the above-named company should not be confused with the American organisation of a similar title. An entirely new company is being formed in this country, and the "Regan" devices are to be manufactured in England.

The control system consists of two elements; one comprising the locomotive equipment, and the other, apparatus located on the roadside. The former equipment consists essentially of a speed circuit controller, an electro-pneumatic valve, a shoe mechanism, relay, storage battery, release key, and the necessary conduits and wiring for the electric circuits; also visual or audible cab signals when desired. Fig. 1 shows the arrangement of the various parts as installed on the G.E.R. locomotive for the above-mentioned tests. The roadside equipment consists of a ramp and the necessary connections, illustrated in fig. 2.

The locomotive equipment is so arranged and interconnected as to cause the shoe stem to pick up an indication from the roadside apparatus of the proper characteristic to actuate the relay to one of three positions, namely, "full proceed," "caution," or "stop." As the shoe rides up the inclined surface of the ramp it moves the electric circuit controller to disconnect the storage battery, at the same time connecting the ramp circuit which remains connected during the travel of the shoe over the horizontal surface of the ramp. As the shoe rides down the inclined surface at the leaving end of the ramp the storage battery is again connected and the roadway circuit cut off. When a full proceed or caution indication is received, the storage battery thereafter supplies the indication so received, until the characteristic of the current is changed to actuate the relay to the other position, or to stop the train as the case may be; excepting that the storage battery is cut off from the circuit and energy from the roadside apparatus is substituted at each signal or ramp location momentarily, thus checking the integrity of the roadside and locomotive equipment. When the locomotive equipment is actuated to the full proceed position, the storage battery supplies energy, through a circuit controller directly connected to the stem of the shoe mechanism, and to the magnet of the electro-pneumatic valve; thus actuating the valve so that it closes the brakepipe vent and opens the reservoir supply to the engineman's brake valve. While in the full proceed position the speed circuit controller is cut out from the circuit entirely.

When the character of the current is changed by the roadway apparatus and the locomotive equipment is actuated to the caution position the circuit is as above described, excepting that the speed circuit controller is automatically connected into the circuit. If a train exceeds the predetermined speed for which the speed circuit controller is adjusted it operates to de-energise the electro-pneumatic valve, thus opening the brake pipe vent and causing a service application of the brakes, at the same time closing the reservoir supply to prevent the brakes being released by the engineman's brake valve. When the speed has been reduced to the point at which the controller is set it operates to close the electric circuit, thus again energising the magnet of the electro-pneumatic valve, closing the brake pipe vent and restoring the reservoir pressure to release the brakes.

Having received a caution indication the speed is automatically restricted throughout the caution block, the brakes

applying automatically whenever the train exceeds the predetermined speed and releasing automatically whenever the speed is reduced to the proper point. A stop indication is received whenever the shoe contacts with a ramp which is de-energised. Under such a condition the locomotive circuit is opened, thus operating the electro-pneumatic valve to vent the brakepipe, and causing an application of the brakes, at the same time closing the reservoir supply to prevent release of the brakes at the engineman's brake valve, as described for operation under a caution indication.

In the operation of this system an application of the brakes is made by the automatic control apparatus when any of the following conditions exist: (*a*) When a train passes a signal in the caution position, or a ramp carrying the caution characteristic, at excessive speed; (*b*) whenever a train exceeds the predetermined speed while running in a caution block or over limited speed territory; (*c*) at a stop signal or de-energised ramp.

When an automatic application of the brakes is made by the control system, it may be released, with the device in service, only by one of three methods: (1) By automatic release as in caution or limited speed territory when the speed is below that for which the speed controller is set. (2) By automatic release as when passing over caution or limited speed territory to a clear block, or to unlimited speed territory. (3) By operating the release switch to pass a stop signal or a de-energised ramp.

In order to proceed, after having been brought to an automatic stop, or to pass a stop indication, it is necessary for the engineman to operate a release switch provided for that purpose. The train may then proceed, but only under automatic speed control, until the next ramp location is encountered when, if the block be clear, unlimited speed will be restored.

Ordinarily the system is so installed that no part of the automatic control equipment is located in the engine cab, its operation being entirely independent of the enginemen. It does not in any way interfere with the control or operation of the train by the engineman so long as he obeys signal indications and operates the train safely when closing in upon an obstruction, as a preceding train. It operates, however, promptly when the engineman fails.

The speed-control mechanism is housed in a dust and water-proof case, and is attached to the locomotive as shown in fig. 3. It consists essentially of two parts, one of which revolves with the axle to which it is connected; the other part being arranged for connection with the locomotive circuit by means of a substantial flexible conduit.

The speed controller is of the centrifugal type, the governor being rigidly bolted to the end of the axle. As the wheel revolves the centrifugal governor operates a circuit controlling device which is adjusted to any predetermined speed. Connection to the circuit is made by means of fixed contact springs and binding posts properly insulated.

The shoe mechanism, fig. 4, is mounted upon the tender or locomotive. It consists of a shoe stem, cylinder, and a circuit controller. The latter is attached directly to the shoe stem, which in its travel over the ramp moves a sufficient distance to provide ample movement for selecting between the locomotive and the roadway energy. The shoe stem is held in position for contact with the ramp by means of the cylinder into which the upper part of the shoe stem is fitted, the cylinder being directly connected to the brake pipe, so that the shoe stem is held in the down position under pressure. When the shoe contacts with the ramp constant pressure is available throughout the movement, the brake pipe acting as a reservoir to receive the volume of air displaced from the cylinder and to restore the shoe stem to its normal position. The latter is also directly connected with the brake pipe, being drilled almost throughout its length to ensure a service application of the brakes in case from any cause it should be broken off in service. A bolt lock is provided for fastening the shoe stem in the up position in case it is desired to operate the locomotive fitted with the control equipment outside of train control territory. When the stem is so secured the locomotive circuit is de-energised, thus conserving energy from the storage battery.

The electro-pneumatic reservoir and brake valve device is connected directly to the reservoir supply line, it is also provided with a connection to the brake pipe, fig. 5. When the magnet is energised that part of the valve controlling the brake pipe vent is closed, and the part controlling the main reservoir pressure is open, so that the engineman has full and unrestricted control of the train brakes. When an automatic application is made the magnet is de-energised, the brake pipe vented so as to provide a service application, and the

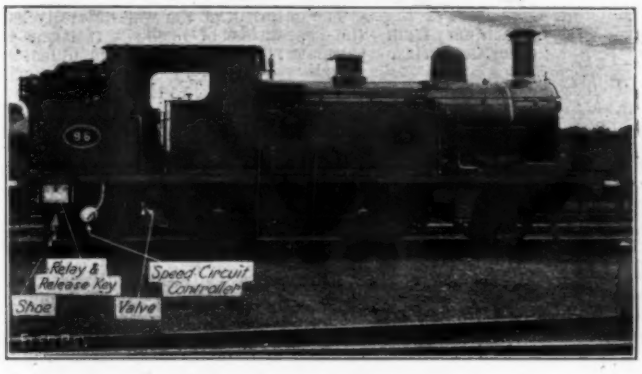


Fig. 1.—Locomotive Equipment.

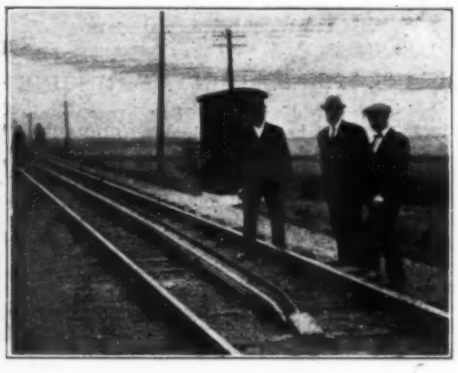


Fig. 2.—Track Ramp.

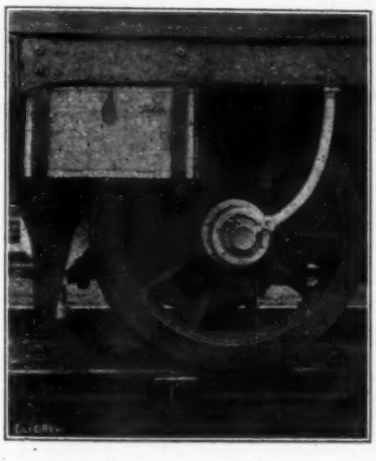


Fig. 3.—Speed-control Mechanism.

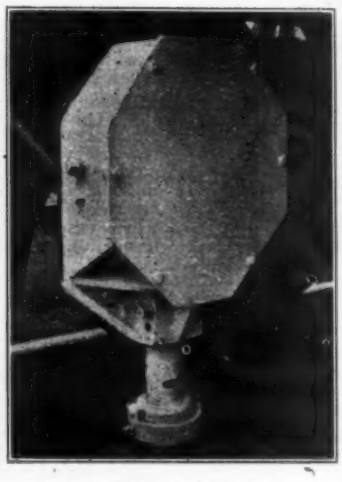


Fig. 4.—Shoe Mechanism.

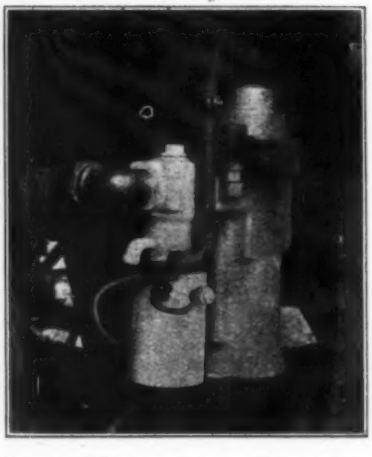


Fig. 5.—Electro-pneumatic Brake Valve.

reservoir supply closed, so that the brakes cannot be released from the engineman's brake valve.

The roadside apparatus consists of a ramp, fig. 2, a battery, relay, and the necessary wiring for connecting the ramp with the signal system, or with the track circuits, or both as the case may be. The ramp is built up of angle iron with a copper insert; it is mounted upon cast-iron supports bolted to standard sleepers, being separated from the latter supports by a suitable block or wood stringer. It is made with an incline at each end to ensure proper movement of the shoe mechanism. A standard signal battery, of 10 volts, will provide ample current for proper operation of the roadside apparatus. The "Regan" control may be adapted to any existing signal system; where automatic block signals are installed, the control circuit for the signal system may also be used for the train control system.

From the description above given it is apparent that the "Regan" apparatus embraces a comprehensive system of automatic train control which, when properly installed, will in fact space trains and prevent collisions. The security to be obtained by its positive speed control will, we trust, recommend the system to favourable consideration.

THE CLASSIFICATION OF ENGINEERS.

An important report has been submitted to the United States Engineering Council by the Committee on Classification and Compensation of Engineers, in which it is stated to be the intention of the committee to undertake a vigorous campaign for the purpose of securing recognition of the classification of various positions. The committee hopes that it will receive the earnest backing of engineers throughout the country in making the classification effective. Its immediate aim is to secure for competent engineers such status and "compensation" or, as we should say, salary, as will enable the engineering profession to "attract and retain men of proper calibre to assume responsibilities successfully."

A Congressional Joint Commission has been investigating the same subject, and has presented a report to Congress, in which it is observed that the salary and wage rates for positions involving like duties and responsibilities, and calling for the same qualifications, show wide variations, and that the Government has no standards to guide it, with the result that serious discontent obtains, and the national service has become unattractive to technical men; waste of money, injustice to individuals, and inefficiency in administration are the outcome. Remedial measures are proposed, and are set out at some length in the *American Machinist*, together with the systems of classification proposed by the Commission and by Engineering Council respectively. That of the latter, in the case of civil engineering, as an example, embraces the following grades: Chief engineer, engineer, senior assistant engineer, assistant engineer, junior assistant engineer, senior aid (office), senior aid (field), aid (o. and f.), junior aid (o. and f.).

The "aid" grades range from the rank of tracer and junior draughtsman (without previous experience) up to that of supervising draughtsman with five years' experience or college training. The "professional service grades" begin with the junior assistant engineer, who must have passed through a standard course of instruction and secured a professional degree without experience, or must have otherwise acquired a knowledge of engineering science, together with experience (four years' training); his duties are to take charge of surveying or construction parties, to design details from sketches, &c., under supervision. The "assistant engineer" is responsible for a minor subdivision of an organisation, may take charge of field work, &c., and must have spent two years as junior assistant or the equivalent, and possess a professional degree, or, in its absence, four years' additional experience. A "senior assistant engineer" must have had executive charge of work for five years (three of which as assistant engineer, one in responsible post); "engineer" eight years (three years as senior assistant, three years in responsible charge); "chief engineer" 12 years (four years as engineer, five years in responsible charge). Particulars of the proposed salaries for these posts are given, the lowest (junior aid) being $1,080-1,560, average $1,240 (say £250), and the highest $8,100, say, £1,600.

The salaries proposed by the Commission are in general lower than those of the committee, by 25 or 30 per cent.

These are praiseworthy attempts to arrive at a satisfactory classification of engineers. While the example detailed relates to civil engineering, the system is applied to 23 branches of engineering, one of which, of course, is electrical.

Conditions differ considerably between the United States and this country, but the need for classification is common to both; the schedules of the Joint Industrial Board for Electricity Supply constitute our nearest parallel to the Engineering Council's code, but are of restricted application. When we get an Engineering Council of our own, as we hope to do, the work done by the American body will be very helpful to it.

THE RUSSIAN ELECTRICAL INDUSTRY DURING AND AFTER THE WAR.

Favourable Prospects for Foreign Manufacturers.

As is well known, the electrical manufacturing industry in Russia prior to the war had not reached the stage of being independent of other countries, but had largely to rely upon firms in Germany, which had also established branch works in Russia, or were otherwise represented in that country. On the other hand, the competition offered by other countries in the Russian market was insignificant, and even the non-German financial groups which obtained concessions for power stations and tramways are said to have carried them out mainly with the participation of German firms. Under these circumstances it is of particular interest to hear what a German has to say concerning the electrical industry in Russia during the past five years, as is related by Herr N. O. Lifschitz in a recent issue of the Berlin *E.T.Z.* Although not specifically mentioned, it would appear that the author was one of the Germans who remained in Russia during the war; his statements are summarised below:—

Machinery from other Countries.

The outbreak of the war naturally led to the suspension of business relations with Germany. As the Russian manufacturing works produced mainly articles which could be more favourably made in the country owing to the Customs tariff, but very few products of bulk output (installation materials, measuring instruments, cut-outs, &c.), as well as machines and apparatus of complicated construction, it was necessary at once to seek markets for obtaining substitutes for the deliveries which were no longer available from Germany. The Russian firms sent representatives to other countries for this purpose, and although machinery and plant were procurable early in the war, as a result of the existence of large stocks, the conditions in this respect underwent a change as the belligerent nations themselves required the materials for war work. A further difficulty arose from the fact that the German practice introduced in Russia differs from that in use in other countries, so that it was first necessary for the latter to adapt their manufactures to the Russian standards, which are identical with those of the Verein Deutscher Elektrotechniker, of Berlin. Sweden and Denmark first came into consideration for deliveries. It was impossible, however, for the Swedish firms fully to meet the great demand; and then the transport which was characteristic during the war of manufactures from hostile countries, via neutral countries, to Russia, was commenced. It was thus actually possible to receive German machinery in Russia during the war, and at first of the same types as in 1914, until the deliveries became difficult, owing to high duties, the more uncertain transport possibilities, and the gradual substitution by Germany of iron for copper. Holland also participated in the business to some extent, together with Japan, although the latter's plant was not good, and Japan, therefore, had to restrict her exports to those of lamps, conductors, and installation materials. The alterations in the standards for machinery and apparatus which were made in Russia in 1917 were not of much advantage to Japan, whose deliveries, except lamps and conducting materials, were limited solely to Siberia.

Orders for America and England.

The participation of France was limited to the supply of some instruments of precision, apparatus, and special machines, and that of Switzerland to meters and some machines and turbines, which in certain cases were on the way to their destination for a period of two years or even longer. Nevertheless it was soon perceived that the only sources could be the United States and England, to some extent, because the latter was largely occupied on her own requirements. As a consequence, the Russian A.E.G. entered into relations with the General Electric Co., of Schenectady, the Siemens-Schuckert Works with Siemens Brothers, and the Dynamo Co. with the Westinghouse Co. At first the connections took the form of simple purchasing transactions, and were limited to orders for quick delivery; but the Russian industry was too much accustomed to German products to break off for ever and introduce new types. In the middle of 1915 the conclusion was reached that the war would not soon be over, and as a consequence a beginning was made with the placing of orders for large machines for remote delivery. In the meantime the works in America and England became crowded with orders, so that the time for delivery had to be extended, and not seldom reached from 12 to 18 months. The first noteworthy deliveries from these countries only arrived towards the end of 1916, and as the Russians thereby got to understand American and English types for the first time, business became brisk, and the value of the orders placed in England and America amounted to 25,000,000 or 30,000,000 Imperial roubles at the end of 1917, although these were only partly executed, as the revolution took place in the meantime.

The author proceeds to state that many of the machines and apparatus which reached Russia were held up at the ports of Archangel, Vladivostock, and Alexandrowsk, as the railways were unable to transport to the interior the immense quantity of goods which had accumulated at the ports, and millions of hundredweights of goods remain there to-day. At

the most, from 20 to 30 per cent. of the machinery and apparatus ordered reached the interior before the blockade was declared, and a still smaller percentage had been set in operation. What was placed in service proved to be of excellent quality, the American and English machines being liberally dimensioned; the measuring instruments and apparatus were very heavy, and soundly constructed, and the prices were consequently excessively higher than those of German manufactures, and the freight and duty were likewise considerably greater. The sequestration of the undertakings of the German firms which took place in 1915-16 exercised but little influence on the general situation of business, especially as it was not carried out thoroughly.

Manufacturing in Russia.

Coming to consider the question of manufacturing in Russia in order not to be entirely dependent upon imports, the author remarks that soon after the outbreak of the war the absolute necessity for extending the existing works or the erection of new establishments was recognised. Great difficulties, however, were experienced in this direction, as the large Russian works were too much dependent upon the German works in a technical respect, and had neither material nor sufficient technical staff available for new types, schemes, &c. Nevertheless, the best possible was accomplished. Already in 1915 one of the most important works—that of the A.E.G. at Riga—had to be removed, together with thousands of tons of raw materials, machine tools, &c., and thousands of workmen and officials, to Kharkoff, where a large new works was erected, capable of competing with foreign firms. This works will probably play a great part in Russian industry in the future, as it is situated in the centre of the coal and iron and steel industries, and is equipped for the production of very large machines. In addition, the works of the Volta Co. had to be removed from Reval; Siemens & Halske, and the Siemens-Schuckert Companies extended their establishments, and erected new works, as also did the Dynamo Co.; whilst the Swedish Allmänna Co. started a works in Russia. Besides these large works, quite a number of small works were erected, although they were not very successful owing to the lack of technical staff and materials.

The production of installation materials was begun at the instance of the Electrotechnical Department of the War Industry Committee, and this branch was continued by the management of the Electrotechnical Department of the Superior Council, which is identical with the department just mentioned. Moreover, a number of lamp factories was established, although they were only partly successful, and only two of them were able to produce in 1917-18 at a rate of 500,000 lamps per annum. It is probable that these factories will disappear on the resumption of commerce with other countries, but it is assumed that one of the principal companies will start a large factory as soon as conditions become normal.

The Future Outlook.

As to the future prospects which will result from the resumption of trading relations with Russia, the author states that one thing is certain—that it will scarcely be possible for all the electrical firms combined, both those in allied countries and those in former enemy countries, to meet the requirements of Russia in electrical machinery and apparatus during the next 15 years, owing to the depreciated condition of the existing plant and the lack of lamps, installation materials, tramcars, train lighting sets, &c.

The dispatch of engineers and technicians to Russia, in the opinion of the author, is of equal importance to that of the supply of plant to that country. The German engineers employed in most works were expelled at the beginning of the war; many of the Russian engineers were killed; and the American and English engineers who gained a good reputation for carrying out satisfactory work during the war, and who gained the sympathy of the Russian works' staffs, had to leave the country two years ago. It is, however, considered that as English is but little known in Russia, and German fairly well known, those engineers who proceed to the country and have a mastery of German will, therefore, be able to get along very well with the Russian officials and workmen.

The Nationalised Industries.

As in the case of other branches of industry, so also have the electrical companies and firms been nationalised. The author states that in connection with the Superior Council at Moscow, a department for electrical engineering is being formed, and is administered by the management, as previously mentioned, of the Electrotechnical Department of the War Industry Committee, and several engineers on the latter belong to the department. The companies, as for instance the A.E.G., Siemens, &c., only figure as sections (groups), and their directors, only partly consisting of former directors, but for the most part men elected by the staff and workmen, can be considered as group leaders. The Budget for each group is prepared beforehand by their leaders for several months forward and placed before the Electrotechnical Department of the Superior Council, which sanctions the credits and gives instructions through the National Bank (State Bank). There is no question of any profits, as any possibility of earning profits is precluded by the high wages of the staff and workmen, and the other expenses. The firms simply live at the cost of the National Bank, which has placed immense sums at their disposal.

An Electrotechnical Department also exists at Petrograd in connection with the Severoraja Komuna (Commune of the Northern District), for dealing with the activity of the electrical undertakings in that region. Moreover, a Superior Electrotechnical Council has been established on which are represented the former directors and other leading persons in electrical engineering who have remained in Russia. While the Electrotechnical Department of the Superior Council is occupied with economic questions, the Superior Electrotechnical Council deals with affairs of a more general and technical nature, and particularly fixes the guiding lines for large schemes of the future, the standardisation of machines and apparatus, and similar work.

Internal Competition at an End.

Any mutual competition between the firms is excluded through the undertakings having been vested in the general community by the Soviet Government, and canvassing for business is, therefore, superfluous. Officials and men work according to the tariff fixed by the Superior Council. It is indisputable that this method of working has not exercised a favourable influence in increasing the efficiency of the men, but the exclusion of competition has brought about an important change in the sense that instead of the works having still to accommodate themselves to the requirements of Russian engineers who formerly devoted more attention to theory than to practice, the works now produce and supply uniform types of machines, which the customers have to accept. It is admitted that an educational effect in this direction was produced on Russian customers by British and American firms during the war. The production in the works severely suffered during the revolution, especially through the removal of works' plant to and fro, particularly in the case of the A.E.G., which is now known as the Russian General Electric Co. It is, however, impossible to give any statistical data, but it can be definitely stated that the production is very small as compared with the demand.

In conclusion, the author remarks that during the revolution, as during the war, it was impossible to proceed with the establishment of large new generating stations and tramways. But this circumstance has not prevented the preparation, as far as possible, of the most comprehensive schemes for the future involving expenditure amounting to milliards of roubles, the fate of which yet remains to be decided.

CORRESPONDENCE.

Letters received by us after 5 P.M. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Commutator Construction.

Regarding the article in your "Notes" section headed "Novel Commutation Construction," I beg to inform you that this method of constructing small commutators has been, and still is, now in common practice in all shops that specialise in motor repairs and commutator manufacturing. Personally, ten years ago I constructed commutators exactly as described in your article. I am not criticising the article, but would like to point out for the benefit of your readers that there is nothing novel in this method of commutator construction.

H. Ashdown.

London.
October 20th, 1920.

[The note in question was quoted from our contemporary *Power*. We are glad to know that this country is ten years ahead of the United States.—Eds. Elec. Rev.]

Domestic Supply Pressure and Wiring.

I read with much interest Mr. Wordingham's article in the Electrical Review recently, in which he suggested cutting down domestic installation costs by allowing the wiring of a house to assist the cause of electric heating. Persons to my knowledge were much struck with the suggestion, but I doubt if anybody has been so hard hit as myself. As a fact, it was such a severe impact (I was having lunch at the time) that on reaching my office I found I still had my unpaid bill in my hand.

But the point of it all is that the scheme could be enlarged tremendously, as it opens up a suggested new sphere of action.

No doubt everyone is aware that there are such things as sewers (and this reminds me of a village I know where they were given the option of having electric light or drains; of course they chose electric light), but has the idea of an electrified one appealed to anybody? I must make myself clearer in this. Are not some of these cable ducts which carry high-tension lines nothing more than sewers carrying electric currents?

Now Mr. Wordingham had electric heating in mind when he suggested heat-giving house wiring, not electric cooking. Pancakes could no doubt be wound round the

wires in question, as additional insulation, but this was not Mr. Wordingham's idea.

Since the tendency of the station engineer to-day is to welcome heavy cooking and heating loads between peaks, the suggestion alluded to, which applies to heating and not cooking, might very well go further than this. Why not increase the scope of the idea by utilising the heat in the supply cables for supplying additional temperature for houses along those streets where the cable runs? The I^2R losses which increase with the domestic loads, in a small cable of suitable material, can be forced by means of a fan placed at the power house or feeder pillars into ducts leading from the "sewers" to the houses referred to. Houses, therefore, would not only be supplied with additional heat, but would be ventilated besides; a valve at each house could be used for heat regulation or for shutting-off if none be required.

I am only a graduate of the I.E.E. at the moment, and unless I can help it I hardly think I shall ask Mr. Wordingham to propose me for transfer of membership!

M. O. Fuller England.

London.
October 21st, 1920.

With reference to the letter from Mr. Inch, which appeared in your issue of October 15th, may I point out that the method of looping described by your correspondent as the "American method" has been in common use in this country for many years, especially with twin lead-covered cable, and was being used by the writer so long ago as 1896.

G. C. Allingham.

Hendon,
October 25th, 1920.

What is a "Qualified Electrical Engineer"?

The phrase "qualified electrical engineer" frequently seen in advertisements seems somewhat ambiguous, at all events as compared with qualifications in other professions. Could you oblige with a clear definition of the difference between an "unqualified" and a "qualified" electrical engineer?

I have heard it stated that no man can be considered "qualified" unless he has (*a*) passed through a university course, and (*b*) become a full member of the I.E.E. Do you agree?

Quericus.

October 18th, 1920.

[Two essential factors enter into the training of an engineer: Scientific knowledge and practical experience. The former cannot be imparted in a workshop; the latter cannot be gained at college. As a fully qualified electrical engineer must possess both qualifications, it follows that he must have devoted some years to technical studies, and spent some years in practical work, in order to acquire them. Technical training is most efficiently conducted in the institutions—technical colleges and universities—which are specially organised for that purpose, but it can be given wherever competent instructors and suitable apparatus are provided, and some large firms make such provision (but they are exceptional). It cannot be said, therefore, that a university or college course is indispensable. With regard to the I.E.E., admission to full membership of that institution nowadays does imply that the member is a fully qualified electrical engineer, in some branch of the profession; but it is not yet compulsory to join the institution, so that non-membership is not evidence of want of qualification.

We must, therefore, be content with the general statement that a fully qualified electrical engineer is one who has received an adequate scientific and technical training, no matter how or where, and has been engaged in industrial engineering operations for at least three years.—Eds. Elec. Rev.]

Delivery Dates.

May I call your attention to a serious disease which is apparently spreading itself amongst English manufacturers and agents to-day? This disease renders sufferers liable, apparently, to adopt any ruse for capturing orders, but particularly that of giving good delivery dates, which, by the way orders are *actually* executed, it must have been obvious to the tenderers at the time of quoting, could not possibly be carried into effect.

The following particulars show how flagrant this underhand method has become:—

Date of order.	Delivery promised in	Overdue.	Remarks.
October 14th, 1919..	—	12 months	Not yet delivered
December 20th, 1919	6 weeks	87 weeks	" " "
April 27th, 1920 ..	14 "	11 "	" " "
June 10th, 1920 ..	8 "	11 "	Delivered
" 18th, 1920 ..	5 "	14 "	Part delivered only
" 2nd, 1920 ..	1 "	17 "	Not yet delivered

Most of these particular orders were urgent, and were placed with the respective (and apparently respectable) firms whose delivery dates were the best, other things being equal.

I am well aware of the difficulties that have had to be faced in the engineering trades during the past eighteen months, but I am confident that some of the orders in question were given delivery dates not in good faith. Such practice is intolerable, and the sooner it is dispensed with the better.

C. Culmer Hodges,
A.M.I.E.E., A.M.Mech.E.

Electricity Works, Dawlish.
October 21st, 1920.

REVIEWS.

Continuous Current Machines. By S. P. Smith, D.Sc. Pp. 63; figs. 10. London: Benn Bros., Ltd. Price 5s. net.

"The clearer fundamental principles are understood the easier it will be to produce competitive designs." Everyone will agree with the author in this statement. The fundamental principle of the dynamo is the interaction between a moving conductor and a magnetic field, and to get the fundamental principle in its universal form, that is, not restricted in any way, he starts off with the investigation of the case of a coil moving in a pulsating field. This is the most complex case which arises in certain types of A.C. machinery, but it is not a case usually taken as a starting point in the ordinary text-book on dynamos. A beginner would certainly prefer to be inducted into the science of electrical engineering by easy stages, beginning with the movement of a one-turn coil in a stationary field, then passing on to a coil of several turns in one slot, then to a coil spread over a certain part of the armature, and finally the movement of such coils in a pulsating field. The author's mathematics are quite clear, and easily followed by a reader who has some knowledge of the calculus, but whether the connection between the formulæ and the process in nature which they represent will be grasped by a reader who has only a superficial notion of how a dynamo works (that is, a beginner) is another question. Obviously the author does not intend his book for beginners, but only for advanced students and practical engineers, and it would not be fair to review it as if it were an ordinary text-book.

Looking at the little book from this point of view, it will be found admirable. After having investigated the general case, the author proceeds to the simpler case of a stationary field and moving coil, then deals successively with E.M.F. induced, and armature windings for D.C. machines. Here he introduces vector diagrams to show how the total brush E.M.F. is built up from its components. His indiscriminate use of the terms "E.M.F." and "pressure" is a little disturbing. One generally means by E.M.F. something occurring within a circuit, and by pressure that which appears at the terminals.

In the following sections we find the different types of armature winding, including the series-parallel, or so-called Arnold winding, a dissertation on the conversion of energy leading to the conception of the output coefficient, the use of equalising connectors, and the effect of armature reaction. As regards equalising connectors, the author does not enter into details to any great extent, but refers the reader to papers by Lulofs and Hawkins, who showed that the circulating currents between brushes of the same sign are reduced by the effect of armature reaction. A sentence immediately following is: "Of course, equalising connections must not be regarded as in any way essential, and many machines work quite well without them." It he had restricted his statement to four-pole machines he would have been nearer the truth. His further statement that an excessively low resistance in the equalising rings leads to considerable loss and heating in the armature winding is also open to doubt. The primary role of equalising rings is to relieve the brushes from circulating currents, and this is mainly accomplished by armature reaction produced by some armature coils carrying more current than others. This certainly means some increase in the heat loss in the armature winding taken as a whole. Additional to this we have the ohmic loss in the rings. If we increase the resistance of the rings we decrease the loss in the winding and increase that occurring under the brushes (to say nothing of the less favourable conditions of commutation) so that the use of a small section of equalising rings cannot be justified on the ground of avoiding loss of power, but only on the ground of avoiding expense. In any simple series, multiple series, or series-parallel winding the number of conductors per pole pitch cannot be precisely the same between any two poles, and therefore there must be a slight difference of potential between brushes of the same sign, so that commutation becomes more difficult as compared with a lap wound armature. For stationary machines series and Arnold winding is not much used in England, but on the Continent such machines are fairly common. In order to see what practical experience can teach us in this connection the author formulated eight questions dealing with various details as regards such windings, and sent them to six of the leading continental firms. All sent replies, and the author gives their replies on pp. 24 and 25. The reader will find it useful to study them carefully.

The general subject of commutation is treated in the following pages, but not in any great detail. We are told that Hobart's formula for the reactance voltage is in favour with designers, because of its simplicity rather than its accuracy, but the formula itself is not given. The author rightly assumes that his readers know it. We are also told that the quality of the brush must be suitable for the particular reactance voltage calculated by formulæ given on p. 32, but how a selection out of the large number of brushes on the market is to be made, is not stated.

The second part of the book is an illustration of the modern and scientific method of the design of a dynamo. For this purpose the author selects a 350-KW. machine; speed 200 R.P.M.; shunt wound; brush voltage 500; armature current 700 amperes. He starts by assuming a magnetic loading of an average gap induction of 6,000 lines per cm.^{2} and an electric loading of 300 amperes per cm. armature circumference. From these figures he deduces the required D^2L, and the output coefficient which comes to 2.9. The best number of poles is next determined by rough preliminary designs for machines of 6, 8, and 10 poles. The most promising design is that of an 8-pole machine, and this is worked out in all essential details. A plate showing longitudinal section and end view of this machine is given. Matters of practical importance are kept in view. Thus we find that in the selection of the winding the possibility that an armature of this size might at some time be required in a converter, the winding is so arranged that tapping points can be found providing exactly the same alternating voltage between any pair of slip rings. The space required for slot insulation is worked out (on rather liberal lines) and the iron losses are determined by the use of a formula for core and teeth. In this connection the author refers to a book ("Papers on Design of A.C. Machinery"), of which he is part author, where on p. 368 curves are given. On comparing these with the curves published by Miles Walker on p. 59 of his "Specification and Design, &c.," we find that there is considerable discrepancy, partly due to Smith assuming the Steinmetz exponent of 1.6 to hold good right up to an induction of 26,000, whereas Miles Walker makes allowance for the fact that the exponent becomes lower at high induction. On the other hand, Smith points out that the losses calculated by his method are only valid if the plates are properly treated, and that the iron losses may be doubled if "no precautions are taken to reduce avoidable losses." In calculating temperature rise, the author is a little too optimistic. He uses the well-known formula which takes account of surface speed, but his coefficient k is only about $\frac{1}{3}$ of what is considered a safe figure. His k is 1.8, whereas most designers take 3. The exact temperature rise of the commutator is not worked out, but the author states with perfect truth that in this particular case the heating will be small. We cannot, however, agree with him in the statement that having worked out the brush contact resistance loss, we need not trouble about the effect of the brush friction loss. In his case he finds the former to be 1,400 watts, the latter he does not work out, but on doing so it will be found to be something between 400 and 500 watts, and this in comparison with 1,400 can hardly be considered a negligible quantity. On the whole, he has produced a very good design, as is shown by the table of efficiencies. At $\frac{1}{2}$ load the efficiency is 0.942, and even at $\frac{1}{4}$ load it is 0.913. His booklet will be very useful to advanced students and practical engineers.

GISBERT KAPP.

The Coolidge Tube. By H. PILON. Pp. 95; 59 figs. London: Baillière, Tindall & Cox. Price 7s. 6d. net.

This little book of some 90 odd pages is a translation from the French of M. Pilon's book. It may be taken as a fairly adequate summary of the state of knowledge of the Coolidge tube about 1916. The translator has done his work moderately well.

The Coolidge tube is one of the land-marks in the progress of radiology. But it is of even wider interest as an outstanding example of what may be achieved by an industrial research laboratory, generously equipped and directed by men with vigour, resource, and imagination, and unhampered by lack of funds.

The history of the Coolidge bulb is bound up with that of the art of manufacturing and working the metal tungsten. Dr. Coolidge's name is now associated with the working out of the details which made it possible to purify and reduce wolframite on a commercial scale, and subsequently to sinter the friable tungsten into workable blocks. When the General Electric Co. of America was led to take up the manufacture of X-ray bulbs, Dr. Coolidge's work on tungsten at once provided them with a metal which was almost ideal for the severe conditions which the target of an X-ray bulb has to satisfy. It is essential that the metal of the target shall have:—

(*a*) A high atomic number, this factor controlling the output of X-rays.

(*b*) A high melting point and low vapour pressure, otherwise the intense heat generated will melt the target and distil metal on the inside of the bulb.

(*c*) A high heat conductivity and a high specific heat.

There are few metals commercially available which can compete with tungsten in the light of the above requirements.

Having settled the question of the target, Dr. Coolidge was then faced with the problem of the residual gas in the bulb. Many opinions were available but few facts, and he proceeded to try out matters for himself. Nitrogen and oxygen were found to be unsuitable because they reacted with tungsten at high temperatures. Hydrogen, argon, helium, &c., proved objectionable for other reasons. Moreover, in the case of all the gases the pressure was found to fall with use, the reason being that the gas molecules are fired into the glass bulb and mechanically trapped there. In short, it was realised that the well-known occasional fickleness and crankiness of gas tubes were inseparable from them as such, and Dr. Coolidge decided to eliminate the gas as a working factor by removing it as far as was humanly possible, and to generate the cathode rays by the use of a hot cathode. The latest design of cathode consists of a small tungsten spiral, independently heated, surrounded by a bowl of molybdenum which serves to focus the cathode rays on the target.

The process of exhaustion is all-important. Langmuir pumps with liquid-air traps are used, and the bulbs are heated to just short of the softening point while exhaustion is proceeding. The electrodes are raised to a white heat by passing a heavy discharge for some hours.

The present position is that the Coolidge tube has firmly established itself in popular favour, and is slowly ousting its earlier rival—the gas tube. Later developments have been in the direction of smaller bulbs which in design are becoming more of an engineering job.

About a third of the present book is devoted to a description of the devices employed to eliminate the extraneous X-rays from parts of the bulb other than the actual target. In the end, however, it is concluded that the degree of the defect does not justify the means necessary to cure it.

Above all things, the Coolidge tube has brought precision to the X-ray operator, who, secure in the knowledge of the fixity of the focal spot, can control the degree of penetration of the X-rays, and also, and moreover quite independently, the output. As a result the radiographer can not only secure pictures every whit as good as with a gas tube, but, what is more, can repeat the conditions at will to give him the results he desires.

The new science of the X-ray inspection of materials would never have been possible without the Coolidge tube. No other type of tube will give the output. Much progress in radio-metallography has been made since M. Pilon wrote this book, and the matter is dismissed in a few lines. The electrical engineer is proceeding to make the subject his own, and we may look for striking developments in the next few years.

The Motor Cyclist's A.B.C. Edited by HORACE WYATT. Pp. viii+164; 82 figs. London: George Newnes, Ltd. Price 2s. net.

As the title of this book suggests, it deals with everything pertaining to motor cycling in alphabetical order; in fact the book is more or less an abridged encyclopædia of the sport. The general plan is good, but in certain respects the book fails, as is often the case when an attempt is made to cater for the absolute novice and the experienced user, in the same volume. From this point of view space is taken up which might be put to better use. Even the budding motor cyclist hardly needs to be told that accessories constitute lamps, horn, &c. On the purely electrical side, too, there are one or two directions in which an improvement could be effected. Under "Ignition" we are told, quite truly, of course, that the high-tension magneto has superseded all other types of ignition, yet quite an elaborate description is given of the accumulator and coil system of ignition, to the extent of a diagram of the wiring, and also the low-tension magneto system of ignition. Neither of these latter are ever used now, and their inclusion in such a book as this serves no useful purpose. There is some information on accumulators generally which is not out of place, having regard to their increasing use on motor cycles for lighting purposes, but there is a danger of too great brevity for practical application. The modern high-tension magneto is fully described and illustrated, but here, as elsewhere in the volume, there are signs that it is a motor car user who is sometimes speaking to the motor cyclist. It is a very long time—if ever—since a motor cycle was fitted with both coil and magneto ignition, yet mention is made of this, and the reasons why, as if it were a present-day practice. Again, electric engine starters are spoken of, but we have not yet heard of this refinement on a motor cycle. The fact that the editor of the volume was some years ago in the editorial chair of one of the leading commercial vehicle journals—he is now secretary of the Association of British Motor and Allied Manufacturers—may be responsible for these little slips. It is only within recent years that electric engine starters have become standard equipment on cars. Under electric lighting, justice is hardly done to the system now becoming very common in which the magneto for ignition and the dynamo for lighting form one unit, which takes up very little more space than the magneto alone, and we can hardly agree, after experience, that this type of electric lighting outfit, with accumulator, is not easy to apply to motor cycles. It is, in fact, applied to both side-car and solo machines with great success, and anyone who has used acetylene lamps would

not wish to go back to them after having experienced the convenience of electric lighting. The initial cost is the disadvantage. The novice will learn a lot from the book, however, which by the way does not mention the new taxation which has been passed and will come into force on January 1st next. Indeed, the old form of taxation is given in detail, and altogether we cannot help feeling that the volume is capable of improvement in many instances, if it is to fulfil the editor's ambition of being useful to the motor cyclist of experience as well as to the beginner.

NEW PATENTS APPLIED FOR, 1920.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. Sefton-Jones, O'Dell and Stephens, Chartered Patent Agents, 285, High Holborn, London, W.C. 1.

28,717. "Power generating units for locomotive headlights." H. E. Elrod, H. E. Elrod & Co. October 11th.

28,763. "Printing telegraph apparatus." Morkrum Co. October 11th. (U.S., October 13th, 1919.)

28,783. "Electric fuses." J. T. Burden, W. J. Hawes, and H. R. Rivers-Moore. October 11th.

28,805. "Sound-conducting devices for talking machines." D. di Carlo. October 11th. (U.S., June 17th.)

28,815. "Electric safety hand lamps." H. W. Brierley. October 12th.

28,835. "Fuses for electrical circuits." G. Turncock. October 12th.

28,843. "Apparatus for testing sparking plugs." V. A. Trier. October 12th.

28,853. "Suspension insulators for electric wires and cables." F. Rohde. October 12th. (Germany, October 14th, 1919.)

28,861. "Motor controllers." Cutler-Hammer Manufacturing Co. and Igranic Electric Co. (Cutler-Hammer Manufacturing Co.). October 12th.

28,863. "Electric regulating systems." Cutler-Hammer Manufacturing Co. and Igranic Electric Co. (Cutler-Hammer Manufacturing Co.). October 12th.

28,864. "Driving mechanism for electric motors." Cutler-Hammer Manufacturing Co. and Igranic Electric Co. (Cutler-Hammer Manufacturing Co.). October 12th.

28,866. "Electric counters." K. R. Jhamuotila. October 12th.

28,867. "Disposition of safety devices and connections in electric generators, &c." K. R. Jhamuotila. October 12th.

28,874. "Electric signalling." M. D. Dimitrievitch. October 12th.

28,875. "Electric light fittings." E. Stroud. October 12th.

28,876. "Incandescent cathode valves." V. J. F. Bouchardon and M. A. Lesage. October 12th. (France, October 30th, 1919.)

28,898. "Switch mechanism for intercommunication telephone instruments." G. Simonetta. October 12th.

28,902. "Sparking plugs." B. M. Starter Co. and H. A. Savage. October 12th.

28,906. "Means for controlling electric currents and for recording radio signals." C. S. Agate and P. W. Willans. October 12th.

28,915. "Electrical generating plant." D. D. Drury. October 12th.

28,917. "Electric sad-irons." C. W. Winterbotham. October 12th.

28,923. "Electric transmission." A. M. Taylor. October 13th.

28,947. "Accumulator driven vehicles." K. J. Thomson. October 13th.

28,956. "Electric current indicators." A. N. Drummond. October 13th.

28,972. "Electric valves or oscillators." British Thomson-Houston Co. (General Electric Co.) and General Electric Co. October 13th.

28,980. "Electrolytic systems of protection for boilers, condensers, &c., against corrosion." A. S. Gush. October 13th.

28,986. "Electric fuses, &c." O. Kominik and J. Nossig. October 13th. (Austria, March 10th, 1919.)

28,993. "Dynamo electric machines." P. P. Politowski. October 13th.

28,997. "Electric starters for internal combustion engines." F. Neumeyer Akt.-Ges. October 13th. (Germany, October 14th, 1919.)

29,012. "Diaphragms, &c., for telephone transmitters." R. L. Murray and Telephone Manufacturing Co. October 13th.

29,027. "Warning device for circuit breakers, &c." S. A. Berners. October 13th.

29,031. "Electric transmission." A. M. Taylor. October 14th.

29,034. "Electric switches." Cable Accessories Co., A. Crawford, and F. H. Reeves. October 14th.

29,035. "Electric plug-and-socket switches." G. O. Donovan. October 14th.

29,044. "Miners' electric lamps." E. A. Hailwood. October 14th.

29,049. "Electric switch for lighting sets of motor, &c., cycles." J. Eaton and Efandem Co. October 14th.

29,050. "Electro-thermically cutting metals." J. McNeil. October 14th.

29,076. "Sparking plugs." M. Pelizzola. October 14th. (Italy, October 15th, 1919.)

29,085. "Sparking plugs." A. J. H. Elverson. October 14th.

29,089. "Electric starters for internal combustion engines." A. H. Midgley and C. A. Vandervell & Co. October 14th.

29,089. "Telegraphic transmission of pictures." J. C. Grant. October 14th.

29,091. "Regulating direct current voltage in metal vapour rectifier installations." Akt.-Ges. Brown, Boveri et Cie. October 14th. (Switzerland, October 14th, 1919.)

29,097. "Electrical apparatus." Sir J. B. Henderson." October 14th.

29,128. "Maintaining gas electrode in operative condition." P. F. Habicht. October 14th. (Switzerland, October 14th, 1919.)

29,153. "Telephone systems." Automatic Electric Co. and Automatic Telephone Manufacturing Co. (Automatic Electric Co.). October 15th.

29,154. "Distributing arrangements for telephone, &c., systems." Automatic Electric Co. and Automatic Telephone Manufacturing Co. (Automatic Electric Co.). October 15th.

29,181. "Wireless telegraphic systems." E. Holland. October 15th.

29,185. "Electrical precipitation of suspended particles from gaseous media." International Precipitation Co. and A. Mond (International Precipitation Co.). October 15th.

29,189. "Automatic and semi-automatic telephone systems." A. Siemens and Siemens Bros. & Co. October 15th.

29,225. "Brush gear for electrical machinery." W. H. Glaser, W. H. Glazer, Ltd., and A. L. Wickens. October 15th.

29,229. "Electro motors." H. Lustig. October 15th.

29,236. "Sparking plug." E. L. Müller. October 15th. (Germany, October 16th, 1919.)

29,239. "Sparking plugs." A. Fox. October 15th.

29,241. "Means for coupling electric cables, &c." G. Andrew and E. W. Bradley. October 15th.

29,252. "Electric welding apparatus." W. Langdon-Davies and A. Soames. October 16th.

29,258. "Electric switches." J. F. Smith. October 16th.

29,299. "Electric switches." G. Götz and W. Schmidt. October 16th.

29,304. "Vacuum or low pressure bulb electron discharge apparatus." General Electric Co. and C. F. Trippe. October 16th.

29,312. "Fastening electrodes in Rontgen tubes, &c." Elektrische Glühlampenfabrik Watt Akt.-Ges. October 16th. (Austria, October 18th, 1919.)

29,317. "Switches." Arnott & Harrison and J. F. Newman. October 16th.

29,318. "Electric lighting apparatus for motor cycles, &c." G. A. Mathys and S. G. Muir. October 16th.

29,319. "Brush holder for dynamo electric machinery." British Electric Plant Co. and I. N. Whitesmith. October 16th.

PUBLISHED SPECIFICATIONS.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1918.

5,867. "Electric accumulators." G. Marconi. April 5th, 1917. (151,293.)

19,179. "Transmission of single-phase currents over polyphase mains." A. M. Taylor. June 21st, 1919. (151,294.)

1919.

7,031. "Electrically operated synchronising clock systems." A. E. White (International Time Recording Co.). March 20th, 1919. (151,302.)

12,570. "System for supplying electricity to an external circuit without receiving energy from external sources." W. J. Parfitt and A. Jenkins. May 19th, 1919. (151,309.)

15,351. "Telephones." R. L. Murray and Telephone Manufacturing Co. June 18th, 1919. (151,335.)

15,352. "Telephones." R. L. Murray and Telephone Manufacturing Co. June 18th, 1919. (151,336.)

15,436. "Aerial cable systems." G. Vanattenhoven. June 19th, 1919. (151,340.)

15,556. "Amplification of electric currents." British Thomson-Houston Co. (General Electric Co.). June 20th, 1919. (151,346.)

15,621. "Terminal electrical connections suitable for the sparking plugs of internal combustion engines." M. L. Williams. June 21st, 1919. (Cognate Applications, 19,219/19 and 29,446/19.) (151,349.)

15,654. "Electric plug connecting devices." R. W. Blades. June 21st, 1919. (151,353.)

15,688. "Trip mechanism for electric ignition devices for internal combustion engines." A. J. Adams. June 21st, 1919. (151,357.)

15,891. "Housings and casings for electrical switchgear." V. Breeze and A. West & Co. June 24th, 1919. (151,370.)

15,895. "Telephone transmitters and mouthpieces or the like therefor." H. J. Palmer and Telephone Manufacturing Co. June 24th, 1919. (151,371.)

16,173. "Electric switches." S. E. Hall and W. Hall. June 27th, 1919. (151,380.)

16,733. "Electrical cooking apparatus." M. J. Railing and C. G. Nobbs. July 4th, 1919. (151,388.)

16,771. "Radio navigational apparatus." J. Erskine-Murray and J. Robinson. July 4th, 1919. (151,389.)

19,801. "Cross-overs of overhead conductors in systems of electric traction." E. M. Munro. August 12th, 1919. (151,435.)

20,627. "Electric relays." Automatic Telephone Manufacturing Co. and A. E. Hudd. August 22nd, 1919. (151,446.)

22,494. "Thermionic valves, electric incandescent lamps, and the like." General Electric Co. and C. F. Trippe. September 12th, 1919. (151,462.)

22,901. "Electro-magnetic switches." British Thomson-Houston Co. (General Electric Co.). September 17th, 1919. (151,465.)

25,910. "Brush holders for dynamo-electric machines." E. H. H. Hassler and Metropolitan-Vickers Electrical Co. October 22nd, 1919. (151,490.)

1920.

1,843. "Battery ignition for internal combustion engines." R. Bosch Akt.-Ges. November 25th, 1918. (138,101.)

2,592. "Commutator assembling devices." Toledo Standard Commutator Co. March 3rd, 1917. (138,352.)

3,465. "Safety fuses for electric circuits." E. Antinoro. February 4th, 1920. (151,523.)

6,228. "Controllers for electric circuits." Igranic Electric Co. (Cutler-Hammer Manufacturing Co.). March 1st, 1920. (151,533.)

6,360. "Electric couplings." H. A. Douglas. March 2nd, 1920. (151,535.)

6,504. "Brush holders for electric dynamos and motors and other electric machines." A. Armstrong. March 3rd, 1920. (151,537.)

9,030. "Automatic telephone station." G. A. Long. March 27th, 1920. (151,559.)

9,238. "Protective apparatus for multiphase alternating current circuits." Metropolitan-Vickers Electric Co. April 4th, 1919. (141,339.)

10,763. "Brush gear for dynamo-electric machines." East Anglian Engineering Co. and H. C. Waters. April 17th, 1920. (151,562.)

12,056. "Trip mechanism for electric ignition device for internal combustion engines." A. J. Adams. June 21st, 1919. (Divided application on 15,688/19.). (151,564.)

12,057. "Trip mechanism for electric ignition devices for internal combustion engines." A. J. Adams. September 9th, 1919. (Divided application on 15,688/19.). (151,565.)

12,342. "High voltage distributors for electrical ignition apparatus." Akt.-Ges Brown, Boveri et Cie. May 14th, 1919. (Addition to 114,825.) (143,209.)

13,154. "Telegraphic transmitter." Siemens & Halske Akt.-Ges. February 28th, 1919. (143,240.)

16,547. "Current leading-out device in magneto electric ignition apparatus for single-cylinder internal combustion engines." Scintilla. June 21st, 1919. (145,449.)

Labour Protection in Luxemburg.—With a view to the protection of home labour, the Luxemburg Government has published a decree prohibiting the employment of any foreign workman in industry, commerce, trades, transportation organisations, public works of the State or of communities, and, in general, in any enterprise not of an agricultural nature or not producing for home consumption, without preliminary authorisation from the Director General of Commerce, Industry, and Labour.—U.S. *Commerce Reports.*